Scranton Gillette Publication

SEPTEMBER 1958

WATER & SEWAGE WORKS

WATER SUPPLY SEWAGE DISPOSAL

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Snow Station of the Pennichuck Water Works

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Water has been essential to man's existence since the beginning of time. And with the prospect of a world population that may double within two generations, the demands of the future must be carefully considered.

When your water supply system comes face to face with the challenge of increased consumption, will its efficiency be impaired by diminishing carrying capacity? Not if your community is served by Lock Joint pipelines. No tuberculation or corrosion will reduce the initial high carrying capacity of Lock Joint Concrete Pressure Pipe.

Nor, when you need it most, will it be necessary to replace a Lock Joint pipeline because of deterioration or failure. Durable, trouble-free Lock Joint Reinforced Concrete Pressure Pipe offers the tremendous advantages of low first cost and minimum operational and maintenance charges. More important, it is the pipe of maximum economy for the future.

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Pressure • Water • Sewer • REINFORCED CONCRETE PIPE • Culvert • Subaqueous

Part of the Permutit Precipitator-filter-demineralizer plant treating 2 million gallons of water per day at West Virginia Pulp & Paper Company, Charleston, S. C.

She's only five foot two, but she "operates" these six Permutit Valveless Filters

• If these were standard manually-operated gravity filters, it would take 3 husky well-trained men (3 one-man shifts) to open and close heavy valves for shutoff, backwash and rinse. If they were table-controlled automatic filters, the initial cost would be almost *doubled.*

Fact is these filters are in the same price range as manual filters, yet they are *completely automatic.* They shut themselves off from service at just the right bed condition. They backwash and rinse at the most efficient flow rates and for a pre-set length of time. Then they put themselves back into service. The little lady doesn't have to touch them!

Permutit Valveless Filters use a simple design employing basic hydraulic principles to do the "thinking" and the work . . . replacing expensive valves, flow controllers and hydraulic or pneumatic control systems. Initial installations have been approved for treatment of drinking water as well as process water.

Our new Bulletin No. 4351 tells how you can cut both initial and operating costs with Valveless Filters. Call the nearest Permutit man or write to The Permutit Company, Dept. W-7, 50 West 44th Street, New York 36, N. Y., or Permutit Company of Canada, Ltd., Toronto 1, Ontario.

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Ion Exchange • Industrial Waste Treatment

Technological unemployment they calls it...

It's a terrible thing to be put out of business by a machine. Used to be I was the hottest chlorinator fixer in the country. Travelled up and down the coast from job to job. And the pay was better than good.

OH! the fun I had till Fischer & Porter walked in with that new chlorinator! What with all kinds of special materials and fancy diaphragm regulators it hardly ever needed fixing at all.*

Still, I figured it would be twenty years before anybody would take a chance on such new-fangled tomfoolery. Why it didn't even *look* like a chlorinator!

Next thing I knew, those Fischer & Porter Chlorinators were springing up like so many mushrooms. And where one of them appeared, seems like *two* of the old-fashioned kind were cashiered out. Still it took five years for me to see the handwriting on the wall and retire.

• • •

Now, a word to the wise is supposed to be sufficient. If you'd rather not be dependent on chlorinator repairs, why not get the facts on new-fashioned chlorinators from Fischer & Porter Co., 198 Fischer Road, Hatboro, Pennsylvania.

FISCHER & PORTER CO.

Instrumentation and Chlorination

*Any wonder everyone's *trying* to copy F&P's design now?

Vol. 105 No. 9

September • 1958

A Scranton Gillette Publication

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Frank J. Schwemler, Commissioner of Water
Consulting Engineers—Havens and Emerson
Prestressed Concrete pipe by Price Brothers

Cleveland...

...uses Pratt Valves in a tight spot

City installations, with limited clearances and traffic problems, are never easy. This Cleveland project, tying a new booster station into two distribution lines, is about as tough as they come.

Here the specifications could not call only for "dependable valves" . . . it had to be "*dependable valves that are easy to install.*" This is where the engineer and contractor can tap the benefits of Pratt's long experience . . . major features of Pratt Butterfly Valves include exactly those things that simplify difficult jobs: minimum head room, versatile operators that can be buried without vaults . . . and design and construction such that the valve will always be easy to open or close.

If you would like to know more about Pratt Butterfly Valves, 40 page manual B2B is yours for the asking. *Henry Pratt Co., 2222 S. Halsted St., Chicago 8, Ill.* Representatives in principal cities.

See us in booth 134 at the A.W.W.A. Convention in Dallas, Texas; April 20-25

HENRY PRATT

RUBBER SEAT Butterfly Valves

Briefs

Pennichuck Water Works has been serving the citizens of Nashua, N. H., for more than a hundred years. Following the lead of the pioneer founders of this private utility, succeeding management has planned wisely and well for the future. As a result, there has never been a water shortage and none is expected in the planned future. One of the many interesting facts about this water works is that nearly 60 per cent of the water supply is pumped to high service by a water powered pump—page 355.

Cetyl Alcohol for evaporation control has been used in Africa, Australia and our own southwest. Much of the experimentation has been done by a British Company which has developed two methods of creating a film less than one millionth of millimeter thick on reservoirs and storage tanks. Formulations of the materials used are given—page 361.

Telemetering and Remote Control has been used effectively to maintain and improve service at the San Gabriel Water Co. in El Monte, Calif., where service connections increased 4000 per cent in 20 years. Complete supervision and control of the well supply, storage and distribution systems is now possible for one central control station—page 363.

A Water Works Budget for Akron, Ohio, involves responsibility, preparation, control, accounting and administration procedures, which are described in readable detail. Budgeting limitations, income sources, expenditures incurred, budgeting procedures, billing, collection, control of receipts, accounting procdeure and budget control are important details—page 367.

Responsibility for Utility Relocation is a matter that is plaguing water works men throughout the country. In this connection, a Town Attorney in New York State has a number of suggestions—page 371.

The Annual Reference Number of *Water & Sewage Works* has just been published. As heretofore, this issue carries a consolidated five-year index to subject matters and authors (1958 and four previous issues). This five-year index is included because many of the reference articles in the previous four years have not become out of date. Therefore, for a complete reference library, subscribers should keep the current and past four issus. All subscribers received this annual Reference Number. New subscribers during the next year will receive this Reference Number as a premium.

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of liquid flow with

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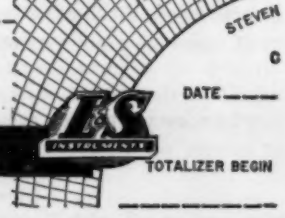
RECORDER TYPE B-FT

Recording, indicating and totalizing meter for measuring sewage or other flows over Parshall flumes and weirs. This instrument has interchangeable flow cams and flow conversion gears... an important factor to consider for sewage treatment plants in rapidly growing communities. With a simple change of cams and gears the Type B-FT Recorder can operate with a different size flume or accommodate a greater range of flow than that for which it was originally purchased. The change does not require factory service. Similarly, change from weekly to daily time scale, or vice versa, is accomplished by merely repositioning one gear — no new parts to buy.

This recorder can be direct float operated or remotely controlled and is available for wall or switchboard mounting, or with cabinet for mounting out of doors directly over the float well. Request BULLETIN 25 for complete details.

STEVENS HYDROGRAPHIC DATA BOOK

Invaluable for your reference file. Contains technical data on recorder installations, plus a wealth of hydraulic and conversion tables. $1 copy. (No COD's)



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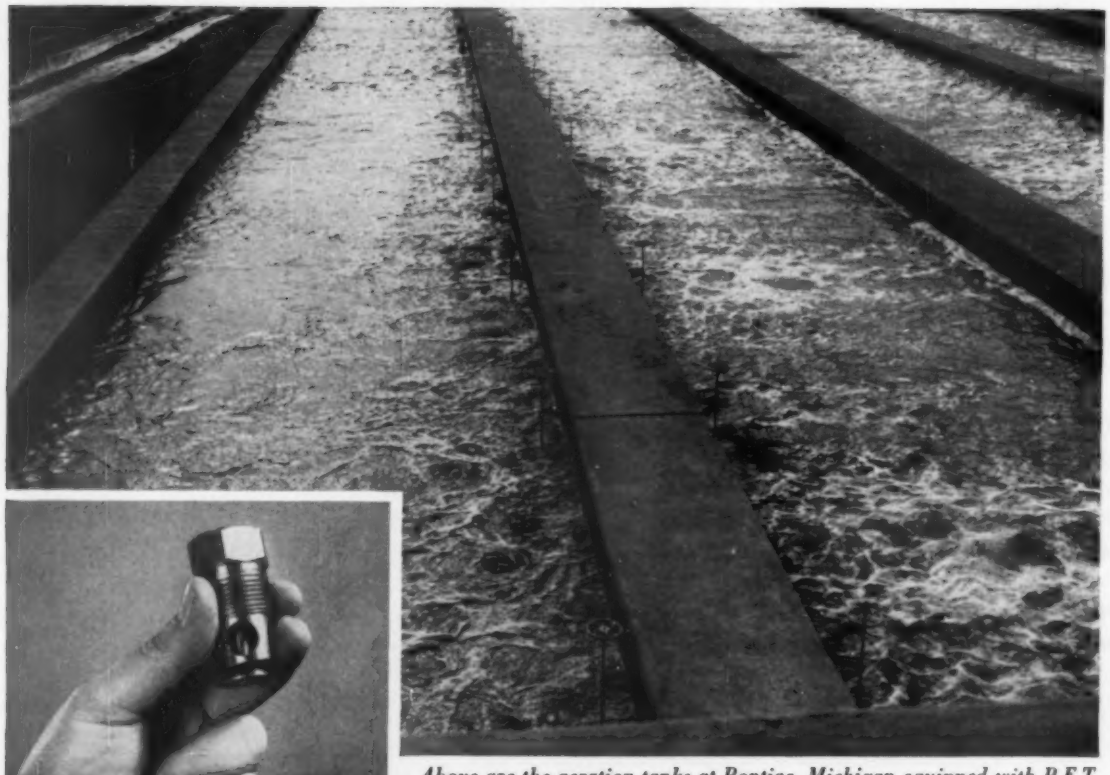

Above are the aeration tanks at Pontiac, Michigan equipped with P.F.T. Valved-Orifices for air diffusion. Note the uniform aeration pattern. At the left is a close-up of P.F.T.'s stainless steel Valved-Orifice.

PROBLEM: Plugged diffusers at Pontiac, Michigan
SOLUTION: P.F.T. stainless steel Valved-Orifices

The high iron content and the hardness of the water in Pontiac, Michigan presented an acute air diffuser clogging problem.

The air diffusers required so frequent cleaning that these operations were practically continuous. In conjunction with the city and Jones, Henry and Williams, the Consulting Engineers, tests were made and a number of different air diffusers were tried. P.F.T.'s Valved-Orifices of corrosion-proof stainless steel have solved Pontiac's problem. They have been in operation without service for over 2 years.

This unique P.F.T. Orifice seats automatically when air pressure is turned off, keeping aeration piping and the rest of the system free from contamination. Wide air dispersal and relatively small bubble size is achieved with P.F.T.'s Valved-Orifices.

Specialized equipment and appurtenances for a complete aeration system were supplied by P.F.T. Perhaps we can be of assistance to you; we invite your inquiry.

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News----Here & There

Francis S. Friel

Consulting Engineer of Philadelphia has been nominated as the next president of the American Society of Civil Engineers. Mr. Friel, who will succeed Louis R. Howson, is a past president of the American Institute of Consulting Engineers and the Federation of Sewage and Industrial Wastes Assns. He is currently head of the U. S. Executive Committee which will play host to the International Commission on Large Dams which meets in New York City this month. Mr. Friel will assume the office of ASCE President at the annual meeting of the Society in New York in October.

Harry G. Hanson

has been promoted to the position of Assistant Surgeon General of the U. S. Public Health Service. Since 1954 he has been director of the USPHS Taft Sanitary Engineering Center in Cincinnati. A graduate of North Dakota State College with a Master's Degree in Sanitary Engineering from Harvard, Mr. Hanson has been a commissioned officer in PHS since 1942. Before that he was state sanitary engineer of North Dakota.

Dr. Charles E. Carver, Jr.

has been appointed associate professor of Civil Engineering at the University of Massachusetts, in Amherst, effective the first of this month. For the past two years he has been affiliated with the Woods Hole Oceanographic Institute as Research Associate in Hydraulics.

Dr. Russell E. Teague

has been elected as Chairman of the Ohio River Valley Water Sanitation Commission. Dr. Teague is Health Commissioner of Kentucky. He succeeds Blucher A. Poole, Chief Engineer of the Indiana State Health Dept. One of Dr. Teague's first acts as ORSANCO Chairman was to announce the selection of 26 men to receive "certificates of esteem for outstanding service in the regional crusade for clean streams." These 26 men include 19 representatives of industry and 7 representatives of community affairs (two are water works superintendents).

Maurice Le Bosquet

has been assigned to the International Cooperation Administration as Chief Sanitary Engineer of the Technical Cooperation Mission to India. TCM/India is one of the largest of the Point IV Missions.

Mr. LeBosquet, who will have headquarters in New Delhi, has been a commissioned officer in PHS since 1936. For the past three years, he has been Assistant Chief of the Water Supply and Water Pollution Control Program for inter-agency activities. During 1951 he was water pollutant consultant to the Government of Belgium at Leopoldville, Belgian Congo, Africa, and he has had many cooperative assignments with the U. S. Army Corps of Engineers and the International Joint Technical Advisory Board.

Arthur H. Beard, Jr.

has established an office as a sanitary engineering consultant in Tucson, Ariz. where he will be associated with Marum and Marum, also consulting engineers. Mr. Beard is a graduate of Purdue University and was the first engineer for the Pima County Sanitary District. He has been an assistant professor of Civil Engineering at the University of Arizona.

Syracuse University

Dept. of Civil Engineering has been awarded a $20,000 grant from the New York State Health Dept. to conduct research on accelerated sewage oxidation ponds. Purpose of the research is to determine the effectiveness of sewage oxidation ponds with various design under New York State climate conditions. The one year project will be directed by Dr. N. L. Nemerow and Prof. J. J. Hennigan, Jr.

Thomas R. Glenn, Jr.

was appointed Director and Chief Engineer of the Interstate Sanitation Commission in early July; he succeeded the late Seth G. Hess. Mr. Glenn had been assistant Chief Engineer for nearly two years, and previously had taught Sanitary Engineering at Rutgers University for 10 years. He is a graduate of the University of Texas (B.S. in Ch.E.) with an M.S. in Sanitary Engineering from New York University; he is a registered Prof. Engr. and a Diplomate of the American Academy of Sanitary Engineers.

Hayse H. Black

Industrial Waste Consultant of the USPHS Taft Sanitary Engineering Center in Cincinnati, Ohio, has been given a 3-month temporary assignment with the International Cooperation Administration in Brazil. The assignment includes conducting training courses in treatment of several different types of industrial wastes and domestic sewage in cooperation with some of the engineering colleges and interested groups of professional engineers in Rio de Janeiro, Belo Horizonte, Sao Paula, Porte Alegro and Curtitiba. He will return Oct. 1.

Edward P. Molitor

of the Madison-Chatham Joint Meeting in New Jersey died on July 4th. He came to the Madison-Chatham Joint Meeting in 1926 and succeeded to the position of Superintendent and Secretary on the death of his father, Paul Molitor, Sr., in 1943.

He was active for many years in the New Jersey Sewage Works Association serving as Treasurer in 1930, Vice President in 1934, President in 1938, and in 1943 became the first representative of this Association on the Board of Control of the Federation of Sewage and Industrial Wastes Associations. He was presented the Kenneth Allen Award for service to the N. J. SIWA.

US RUBBER GIANT ACID HOSE

Keeping water soft during a tough plant-expansion job

The chemical treatment building of the Kansas City Water Works is getting a new addition. This big job will take two years, during which time the building contractor is using a simple and economical means for conveying water-softening chemicals to the water supply.

He uses chemically-resistant U.S. Giant® Acid Hose, furnished with stainless-steel fittings.

The men find it extremely flexible and easy to handle, resistant to abrasion, impact and weather. It remains unharmed by its highly corrosive cargo—hot lime slurry, ferric sulphate, alum solution, soda ash.

U.S. Giant Acid Hose is made for either suction or discharge service, replacing metal pipe because it handles highly corrosive solutions so well.

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Mechanical Goods Division

United States Rubber

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Rockefeller Center, New York 20, N.Y. In Canada: Dominion Rubber Company, Ltd.

News - - - Here & There (continued)

Philadelphia, Penna.

received the Water Resources Council's first National Clean Streams Award. The award was presented to Mayor Richardson Dilworth by

Arthur S. Fleming, incoming Secretary of Health, Education and Welfare.

The presentation was made during the celebration of the Fiftieth anniversary of Conservation in America. The acompanying photograph shows Col. W. F. Rockwell, Chairman of the Water Resources Council with Mr. Fleming and Mr. Dilworth.

Odie E. Walker

vice president and works manager of the Mueller Co., Decatur, Ill., has been named advisor to the Director, Water and Sewerage Industry and Utilities Div. Business and Defense Services Administration, U. S. Department of Commerce. He will serve for six months; he succeeds David L. Wright, who is returning to the Badger Meter Mfg. Co. in Milwaukee.

PHS Publication No. 609

entitled "Statistical Summary of Sewage Works in the United States" is now available from the Water Supply and Water Pollution Control Program, Public Health Service, Department of Health, Education and Welfare, Washington 25, D. C.

The report, authored by J. R. Thoman and K. H. Jenkins is based on the 1957 inventory of municipal and industrial waste facilities.

The report shows that in 1957, 11,131 communities had sewer systems serving 98.4 million persons—increases of more than 2200 communities and 24 million persons since 1945.

Almost 22 million persons still discharge raw sewage to the waterways, 1.9 million have minor treatment only; 76.4 million persons residing in 8,066 separate communities are served by 7518 treatment plants. More than 60 per cent of these plants have secondary treatment, secondary treatment plants having been doubled since 1945.

The report contains various sets of comparative data for the years since 1940 with detailed data on primary and secondary treatment plants.

In Buffalo, N. Y.

the city and five major industries located on the Buffalo River have reached an agreement on a scheme for handling the industrial waste problem of these industries. The city will build a water works to supply the industries with cooling water from Lake Erie. The water after use will be discharged to the river to provide dilution in the summer months as well as dissolved oxygen and alkalinity to react with acid wastes. Cost of the pumping plant and distribution system will be amortized through the sale of water by the city to the industries. The plan was originally proposed in 1946 in a report by Dr. George E. Symons, Consultant to the Buffalo Sewer Authority.

Frank J. Schwemler

has retired as Commissioner of Water & Heat for the City of Cleveland, Ohio, and has opened an office as a Consulting Engineer for Water Works, Sewage, Highway and Municipal Problems in Shaker Heights, Ohio.

Seth G. Hess

died in mid-June following a short illness. Mr. Hess was Director and Chief Engineer of the Interstate Sanitation Commission which conerns itself with water and air pollution in the Metropolitan New York area where New York, New Jersey and Connecticut have mutual problems.

Mr. Hess had been Director and Chief Engineer of the Commission since 1943 and was Chief Engineer from 1936 to 1943. Prior to 1936 he had served with the Federal Public Works Administration, Alexander Potter and Morris Knowles, Inc.

He had also served on the faculty of the graduate school of New York University and was active in committee work in ASCE, EJO, FSIWA, etc. He was a member of ASCE, Fellow APHA, FSIWA, Soc. Mil. Engrs., and Diplomate of the American Academy of Sanitary Engineers. He served as an artillery officer in the AEF of World War I.

Transactions Are Available

of the 7th annual Conference of Sanitary Engineering at the University of Kansas. This particular conference covered "A Kansas Oil Refinery Problem," "Water Conservation through Control of Evaporation," and "Turnpike Sewage Treatment Plants." Copies of Bull. #40 may be obtained from University of Kansas Publications, Lawrence, Kan.

Coming Articles in Water & Sewage Works

Chlorination Guide—Part I	*E. J. Laubusch*
Detroit Sewage Treatment Works	*F. H. Burley*
Digester Net Effective Capacity	*L. L. Langford*
Edmonds Sewage Plant	*H. Hathaway*
Field Testing Centrifugal Pump—Part II	*F. W. Beltz*
High Rate Sewage Treatment	*Ryckman & Edgerley*
Instrumentation and Control in Sewage Works	*W. A. Brown*
Metropolitan Expansion	*R. E. Fuhrman*
Sewer Cleaning and Safety	*N. W. Nester*
Sewage Colloids	*Heukelekian & Weisberg*
Sewage Sludge as Soil Conditioner	*J. Olds*
The Thames Conservancy	*J. Finch*
Water Tunnel Under London	*W. A. Heath*

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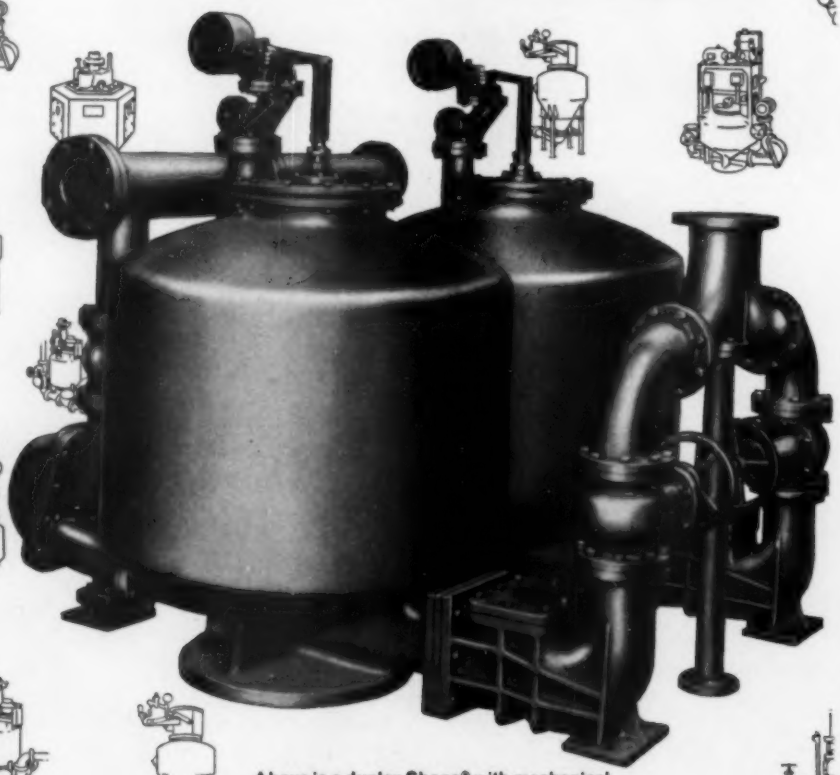
all 212 SIZES and TYPES are JOB PROVED!



Above is a duplex Shone® with mechanical controls—the original pneumatic ejector. The first Shone was installed in 1870. Other Yeomans pneumatic ejectors are: Expelsor®, Packex®, Pneu-Pump, Transporter, and SS Screenings Unit.

There's no risk involved when you specify a Yeomans pneumatic ejector. Chances are your client already knows that it's the most dependable unit he can get . . . and you are able to show him why. Yeomans pneumatic ejectors have exclusive features that can mean the difference between a troublesome 10-year life, and a 25 to 50-year span which is almost maintenance free. In the Yeomans line, also, you can give your client the exact pneumatic ejector required . . . not an "almost model." On your next job, call in a Yeomans representative to show you the difference. He has a slide film which does the job quickly and thoroughly. For your convenience, also, information on Yeomans pneumatic ejectors is carried in Sweet's Catalog.

Ad number E-5801

YEOMANS

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WORLD'S LARGEST AND BEST LINE OF PNEUMATIC EJECTORS

Equipment News

Pipe Locator

901

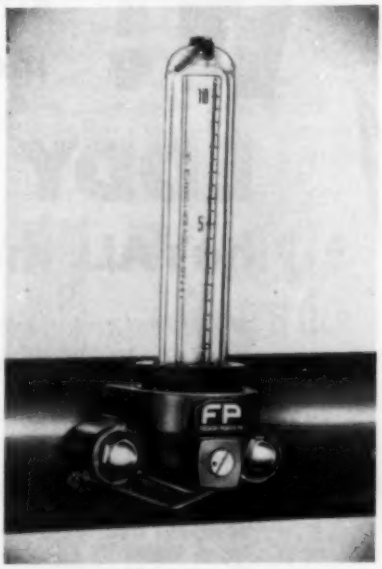
Gardiner Electronics, Phoenix, Ariz., has developed a new transistor pipe locator and metal detector.

It uses a total of 8 transistors, 1 in the transmitter and 7 in the receiver. It uses only 4 flashlight batteries, 2 in the transmitter and 2 in the receiver. The 2 flashlight batteries in the receiver will last 3000 hours and the 2 in the transmitter will last 350 hours, making this one of the most economical metal detectors to operate. It has a maximum range of 21 feet. It also uses metal boxes with baked on paint finish and printed circuits.

New Type Flowmeter

902

Fischer & Porter Co., Hatboro, Pa., has introduced a new type of indicating flowmeter called The Mighty-I that measures flow in either direction and in any pipe size from 1½" to 8" without the use of additional components or accessories.



The new corrosion-resistant flowmeter requires no flanges or matching orifice plates and is easily installed in any line in a matter of minutes. The Mighty-I is suitable for services with flow ranges up to 10 to 1. Readings are made directly by means of a ball float and a linear scale calibrated in gpm. Scales covering flow rates from 3-30 gpm to 200-2000 gpm are available. Since the new meter measures flow without the use of accessory equipment of any kind, inventory is reduced to just the one item.

Differential Pressure Transmitters

903

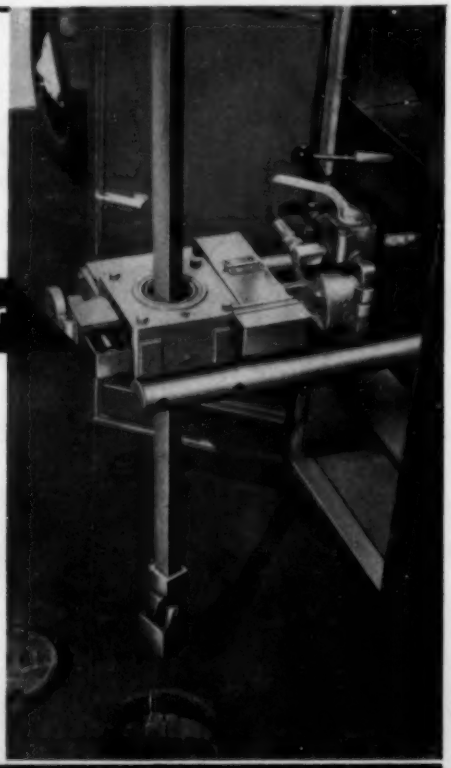
Fischer & Porter Co., Hatboro, Pa., has greatly expanded its line of force-balance Differential Pressure Transmitters featuring the exclusive F & P construction in which measuring circuits are completely immersed and sealed in silicone oil. Units for level measurement and units for the measurement of differential pressures of 0-20 inches to 0-200 inches and 0-30 inches to 0-300 inches are now available. Transmitters are available either

CONTINUED ON PAGE 13A

Truck models operate from truck transmission ... portable units from 3 to 7½ h.p. Save time ... reduce cost ... improve maintenance.

hitch horse sense to horsepower

Make every valve POWER OPERATED... NEW fluid drive all-hydraulic, centralized-control, PAYNE DEAN valve operators.



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improved... streamlined... modernized...the

EDDY Hydrant

has ALL these features...

★ *Optional ground line break flange*
★ *Large diameter barrel for increased flow*
★ *O-ring or standard packing*
★ *New self-sealing rubber ring main valve packing*
★ *No lubrication required for fast, easy opening*
★ *Opens with the pressure—for instantaneous flow*
★ *Closes against the pressure—eliminates water hammer*

The EDDY Hydrant...improved... streamlined...modernized...retains all the basic advantages that have made these hydrants outstanding for four generations. Yet, it has important new advanced design features which provide the utmost in efficient, dependable, longlife fire protection service.

These new important advantages are provided without sacrificing interchangeability of working parts with EDDY hydrants now in service. Now, more than ever, EDDY offers maximum fire protection, economical maintenance and assurance against future obsolescence in your fire-fighting system.

Before buying or specifying hydrants, be sure you know how these advantages may benefit your community.

Optional break flange gives double protection against impact damage

NEW SAFETY FLANGE

NEW SAFETY COUPLING

EDDY VALVE COMPANY
A Subsidiary of James B. Clow & Sons, Inc.

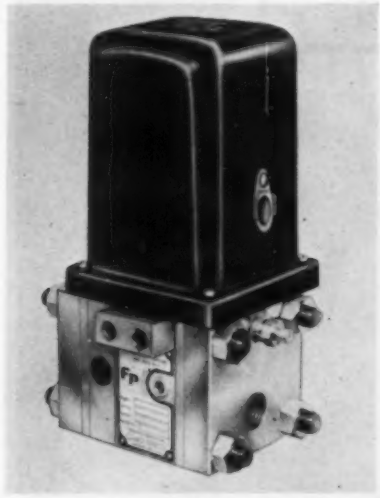
WATERFORD NEW YORK

Equipment News

CONTINUED FROM PAGE 11A

with or without adjustable zero suppression.

Transmitters operate up to 1500 psig working pressure with complete



over-range protection. Calibration stability under changing temperature or pressure conditions is exceptional: less than 1% of range per 100° F; less than 1% per 1000 psi static pressure change.

Through-bolt construction permits easy removal of the unit without disconnecting flanges from the process piping. The all-metal transmitter is furnished with a corrosion-proof fiber glass cover.

"Chemical Rotation" Method of Sewer Maintenance

904

Cloroben Chemical Corp., South Kearny, N. J., has announced a new "Chemical Rotation" Method of sewer maintenance, originated by Arnold Haverlee, Technical Director. This new type of treatment eliminates accumulated grease and slime and serves as a preventive measure against the generation of sulfide odors and consequent corrosion damage.

Recently introduced in Florida, the "Chemical Rotation" Method has been adopted by major cities on the Florida southeast coast, from Key West to Palm Beach. The highly favorable results should be of particular interest to cities and towns along other coastal areas—Louisiana, The Gulf Coast of Texas, Alabama, and Mississippi—where conditions are similar.

Typically, these Florida cities depend on low gradient sewers and numerous lift and pump stations in their sewage collection systems. Consequently the flow is sluggish and delivery of sewage to the plant is further delayed by grease and slime clogged lines. It is under such difficult conditions that Cloroben demonstrates its full worth in effectively controlling odors, and suppressing sulfide formation.

Up-sewer treatment with Cloroben provides a non-septic stabilized influent at the treatment plant permitting efficient operation.

All Polyethylene Acid Pump

905

Fischer Scientific Co., Pittsburgh, Pa., has developed a new all polyethylene SAF-T-PUMP for acids.

The pump screws onto any stand-

CONTINUED ON PAGE 15A

Triangle Brand Copper Sulphate HELPS SOLVE YOUR WATER PROBLEMS

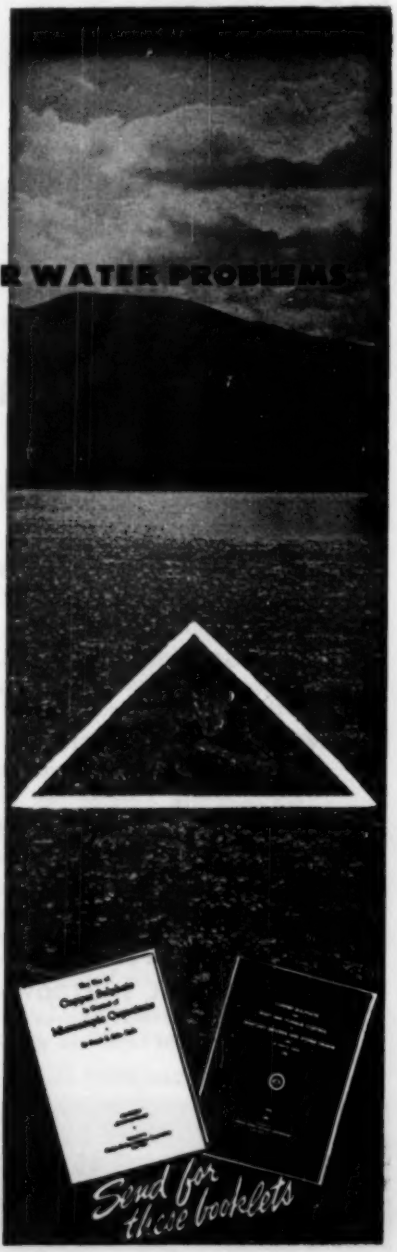
Triangle Brand Copper Sulphate economically controls microscopic organisms in water supply systems. These organisms can be eliminated by treatment of copper sulphate to the surface. Triangle Brand Copper Sulphate is made in large and small crystals for the water treatment field.

Roots and fungus growths in sewage systems are controlled with copper sulphate when added to sewage water without affecting surface trees.

Booklets covering the subject of control of microscopic organisms and root and fungus control will be sent upon request.

PHELPS DODGE REFINING CORPORATION

300 Park Avenue, New York 22, N. Y.
5310 W. Sixty-sixth St., Chicago 38, Ill.



GASLIFTER UNIT

DIGESTER CIRCULATOR-MIXER

INCREASED CAPACITY—GASLIFTER circulated digesters easily handle loadings of 6 lbs. of solids/cu. ft./mo.

BETTER DIGESTION—15 to 20% more gas (methane) per lb. of volatile solids, together with low and uniform volatile acids—all accomplished in single stage digestion at high loading rates.

ELIMINATES SCUM BLANKETS AND GRIT SHOALS—Rapid circulation along roof, walls and bottom disperses grease blanket and prevents loss of capacity due to grit shoaling.

ADAPTABLE TO STANDARD OR HIGH RATE DIGESTION—The GASLIFTER may be applied to either standard or high rate digesters with equally efficient results.

ACCESSIBLE—SPECIALLY DESIGNED LOCKING CHAMBER permits individual inspection and service of stainless GASLIFTER sparging units without dangerous gas loss or digester shutdown.

NO MECHANICAL SHUTDOWNS—GASLIFTER utilizes gas-lift principle and completely avoids mechanical troubles from rag and sewage "string" fouling. Sparjers used to diffuse gas in the eductor tube avoid all orifice troubles.

GASLIFTERS incorporate the patent rights of Joseph Cunetta

Above—Installation at Aurora Sanitary District, Aurora, Illinois serves to illustrate circulation and mixing action achieved with GASLIFTER. Published operating data attests to the resulting increased efficiency.

Walter A. Sperry
Supt., Aurora Sanitary District
Walter E. Deuchler Co., Aurora
Consulting Engineers

Engineers will be interested in Bulletin 25-S-91 for details on GASLIFTERS: and Brochure 25-S-11336 for complete report on GASLIFTER operating results at a full scale plant installation. *Write for your copies.*

GASLIFTER is a trademark of Walker Process Equipment Inc.

WALKER PROCESS

WALKER PROCESS EQUIPMENT INC.
FACTORY • ENGINEERING OFFICES • LABORATORIES
AURORA, ILLINOIS

Equipment News

CONTINUED FROM PAGE 13A

ard 5-point acid bottle. Attached to the pump body are a siphon, a spout and a 4-ounce squeeze bottle, all polyethylene. Once screwed onto the bot-

tle, the unbreakable Saf-T-Pump delivers acid at the rate of 1000 ml/minute with just light, rapid squeezes of the squeeze bottle. There is no afterdrip from the spout; merely press the SAF-T-PUMP's relief-valve button to stop flow.

Gear Assembly For Hypreseal Wrench Operated Valves

906

Rockwell Mfg. Co., Pittsburgh, Pa., has developed a lightweight planetary gear operator which adapts wrench-

operated Rockwell-Nordstrom Hypreseal Valves to gear operation.

Easily installed by one man, it has a 5-1 gear ratio and a 4-1 mechanical advantage. One turn of a wrench or handwheel will close or open the valve.

Developed primarily for valves already in service the gear operator fits directly over the square plug stem and down over the body of the valve. No special wrenches or handwheel are needed with the gear operator since the wrench normally used will fit easily over the operating pinion.

Attachment simply requires the tightening of a set screw on the valve plug stem and adjustment of two top screws which lightly contact the packing injector box. The plug stem projects through the gear operator, causing no interference with the valve's lubricating fitting. The assembly is offered in three sizes depending on the size and working pressure of the valve.

Homomix for Pipeline Mixing

907

The American Well Works, Aurora, Illinois, has announced a new Model

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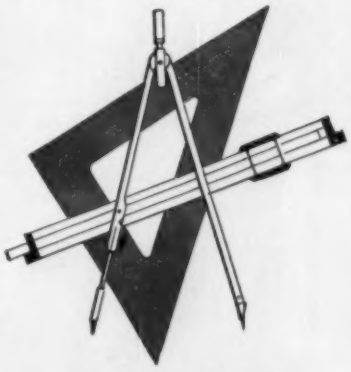


mechanical joint flexibility IS GOOD ENGINEERING

The wide use of mechanical joint valves, hydrants, pipe and fittings has proved that this type of construction is good engineering. The joint is bottle-tight and permits deflection, expansion or contraction in a pipe line, without breakage or leakage. Other advantages include rapid and easy joint assembly.

M & H Mechanical Joint Valves and Hydrants are used not only with mechanical joint pipe made by the different pipe manufacturers, but they are easily installed in old bell-and-spigot pipe lines. The joint is made by a bolted gland compressing a thick gasket into a stuffing box. For water, the gasket is rubber but metal-tipped, duck-tipped, Thiokol-tipped and other special gaskets can be supplied. *Write or phone . . .*

M&H VALVE AND FITTINGS COMPANY
ANNISTON, ALABAMA
SUBSIDIARY OF WALWORTH

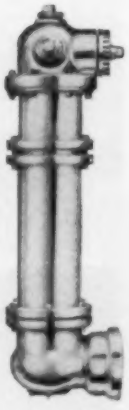
You'll see a demonstration of the completely revolving head. The entire head or nozzle section can be faced in any direction with none of the restrictions imposed by ordinary flanges. All that is necessary is to loosen the bolts in the flange.

We'll be glad to show you the R. D. Wood Swivel Joint Hydrant right in your office

We'll show you the optional breakable flange and stem coupling which permit quick repair and thus give the community better fire protection—and you won't have to get out of your office chair!

We mean a scale working model, of course, about 2 feet high and accurate down to the last nut and bolt. As we take it apart for you, you will see quite clearly the hydrant's sound, simple construction, the smoothly rounded changes in diameter which reduce friction and deliver water at full pressure.

It's a really reliable hydrant. Like to see it? Write us today for a demonstration.



R. D. WOOD COMPANY

Public Ledger Building, Philadelphia 5, Pa.

Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

Equipment News

CONTINUED FROM PAGE 15A

"S" Homomix for low-cost, low-volume continuous pipeline mixing.

This unique development provides many features of the American Homomix for efficient, economical use in a wide variety of application. Saves space, time, and equipment—simplifies and speeds the mixing operation directly in the pipeline, without any need for a mixing tank.

Special design mixing chamber with standard Homomix impeller assures instant, uniform, complete and continuous mixing of liquid, gas or slurry. Easily installed in any position in pipeline. Suitable for production applications up to 30 GPM total flow. Scale-up to standard Homomix size makes Model "S" ideal for pilot plants. Available in iron and in 316 Stainless.

90-Degree Elbow of Transite Sewer Pipe

908

Johns-Manville Co., New York, N. Y., has announced that a new 90-degree epoxy bonded elbow has been added to the company's line of Transite building sewer pipe.

The asbestos-cement fitting will serve as a companion piece to the recently introduced 30-degree elbow and the 60-degree Transite Wye Branch for sewer mains. When added to the constantly expanding line of elbows and bends, both of which come in 11¼-degree, 22½-degree and 45-degree turns, the 90-degree fitting will permit an even greater margin of design freedom in laying out house sewer systems.

The new elbow embodies the Ring-Tite coupling principle that assure maximum tightness by compressing two rubber rings between the pipe wall and the fitting or coupling. This principle has gained wide acceptance in mainline water and sewer service as well as for house connections.

Also in this elbow are grooves with factory-inserted rubber rings that lock the sections together. This enables the ring to provide an effective safeguard against the penetration of roots.

Cycloblower

909

The Air Appliance Division of the U. S. Hoffman Machinery Corp., New York, N. Y., has announced the introduction of a compact axial flow, positive displacement blower/compressor of advanced design and con-

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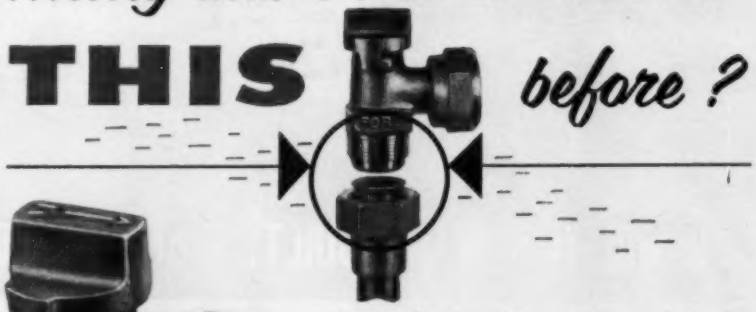
...why didn't FORD think of THIS before?



Now that we have started making the new Ringstyle Valve for copper connections, we've wondered, too, why we didn't think of this simple idea sooner. Now that we have, a patent is pending.

Of course we were proud of the old arrangement. When we introduced the Ringstyle Valve in 1938 it was a brand new idea and the meter coupling nut attached to the valve was an important development in meter setting. But the old design, with its loose ring for connecting the valve to copper, had its disadvantages.

But look what we've done with this new one. We've built the beveled end right onto the valve itself and reversed the thread arrangement. Thus, the standard copper tube nut fits right on the new Ford Ringstyle Valve for an easy-to-make, leak-proof joint. The capacity is not reduced — The appearance and utility are improved.

Former Design

The men who install this new Ford Ringstyle Valve will certainly approve this change because there's no loose ring to drop into the mud or dirt in the ditch. Connecting the valve to the copper service line is simpler, easier and quicker.

Write for information and sample.

FORD

FOR BETTER WATER SERVICES

THE FORD METER BOX COMPANY, INC. Wabash, Indiana

WILL YOUR NEXT TANK OR RESERVOIR GIVE YOUR COMMUNITY THESE PROTECTIVE ASSURANCES?

. . . It will, if it is CB&I -BUILT. . . of WELDED STEEL CONSTRUCTION

It's easy to take steel for granted. Evidence of its workability and durability can be seen anywhere, anytime, any place. But its *particular* dependability as a material of construction for water storage structures reaches beyond the commonplace.

Here is why *CB&I* uses steel; why most *consulting engineers* specify steel; and why more water for municipalities is *stored* in steel than in any other material of construction:

CB&I STEEL TANKS are built to AWWA Specifications—To a factor of safety established by the collective experience of the best engineering knowledge available on the subject of water storage.

CB&I STEEL TANKS ARE "Tight"—A fact that is accepted without question even *before* the structure is fabricated and erected.

CB&I STEEL TANKS are flexible—to provide only specified *known* amounts of differential settlement, which do not affect the utility or safety of the structure.

CB&I STEEL TANKS are stable structures. There is no loss in effective strength of material with the passage of time.

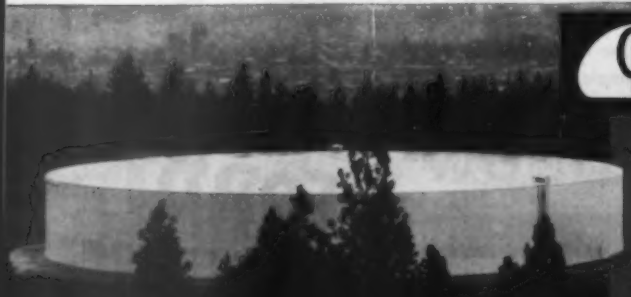
CB&I-BUILT STEEL TANKS are the *responsibility* of CB&I through all phases of design, fabrication and erection. Almost 70 years of engineered *craftsmanship in steel* back every structure. This is your assurance of predictable maintenance costs and long service life.

Be *glad* you can take steel for granted. When your community next considers water storage, remember, *only* steel can *assure* you long term, low maintenance storage —because it is backed by the accurate control and protective assurances established by the American Water Works Association.

Write your nearest CB&I office for further details. Ask for the new bulletin: *Next Door Neighbor to Millions.*

Above: 10,000,000-gallon Horton Cone-roof reservoir meets increased water demands at Oakland County, Michigan.

Below: 10,000,000-gal. Horton® reservoir helps to supply increased water needs at Spokane, Washington. Structure is 240-ft. in diameter.



CB&I

Chicago Bridge & Iron Company

Atlanta • Birmingham • Boston • Chicago • Cleveland • Detroit • Houston • Kansas City (Mo.)
New Orleans • New York • Philadelphia • Pittsburgh • Salt Lake City
San Francisco • Seattle • South Pasadena • Tulsa
Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY,
GREENVILLE, PA. and at NEW CASTLE, DELAWARE.
In Canada: HORTON STEEL WORKS LTD., TORONTO, ONTARIO

Cooperating with the *Water Resources Council* program.

Equipment News

CONTINUED FROM PAGE 17A

struction. The Hoffman CycloBlower is said to combine the most efficient rotor forms with new features not found in similar equipment.

By interrupting continuity of rotor seals without sacrificing the advantages of perfectly symmetrical rotor forms, the CycloBlower eliminates the effect of runout or trapped pockets, allows increased water rates for wet compression or vacuum service, and eliminates shock, temperature and loading due to buildup of pressure.

CycloBlower rotors do not touch. Hence there is no wear, and no need for lubrication within the compression chamber. This assures clean air or gas delivery. The outboard position of the bearings allows full atmospheric venting between the compression chamber, gears and bearings. The compression cycle of screw-type cycloidal rotors is balanced.

New Small Trencher

910

The Charles Machine Works, Inc. Perry, Oklahoma, has introduced its new 1958 Model M-2 Ditch Witch trencher.

Features include new 8″ width trencher to 30″ depth—also 6″ x 36″, 4½″ x 36″ and 3″ x 48″. New speed reduction unit with "Select-O-Matic" shift from digging speed to mobile speed provides four speeds forward and reverse.

Among the new optional features available is a sod cutting attachment. This attachment can be mounted on the trencher in minutes, cuts an 8″ sod strip at speeds up to 40 F.P.M. After trenching and backfilling sod can be replaced, leaving turf with an "untouched" look.

Pumps For Abusive Applications

911

Nagle Pumps, Inc., Chicago Heights, Ill., has developed a new line of pumps, designated the "K" series. These pumps, are designed for abusive applications exclusively, such as those involving abrasion, corrosion, or handling of hot liquids. They are especially desirable for the latter, because of the exposed shaft design. This open bearing stand also makes for economy. Pumps can be stationed either above or below sump liquid level.

The "K" Series are single state, end suction pumps, made in sizes from 1″ to 10″, for heads—in some cases —up to 250′ or more and for capacities in the range of 4,000 gpm.

Flexible Geared Coupling 912

Link-Belt Co., Chicago, Ill., has developed a new low cost geared flexible coupling for shaft diameters up to 1⅞ inches. Called the type MC, it is designed especially for use as a motor coupling—for transmitting electric motor power to pumps, generators, speed reducers, etc.

Basic principles of operation are

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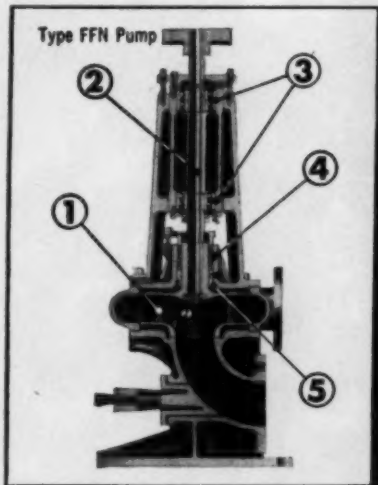
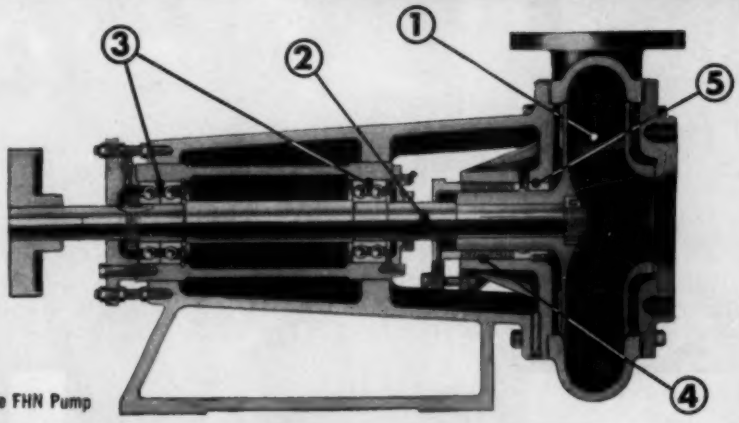


The 5 features you need for low-maintenance pump operation



Wheeler-Economy Non-Clog Pumps are designed and built for one of the most severe types of service—that involving unscreened sewage. The five features shown here are your assurance that whether you need a horizontal or a vertical pump, you get more dependable service with Wheeler-Economy.

TWO NEW CATALOGS AVAILABLE! For a free copy of Catalog F-100 (describing Vertical Non-Clog Pumps), or F-101 (describing Horizontal Non-Clog Pumps), write:

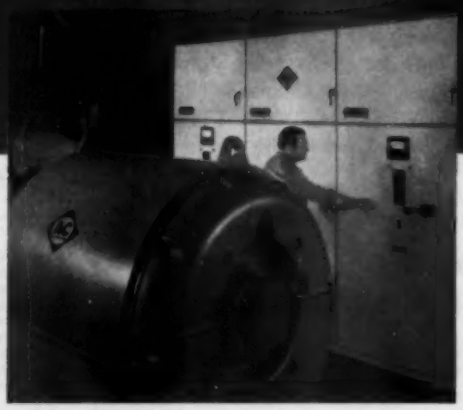
Economy Pump Division
C. H. Wheeler Mfg. Co.
19th and Lehigh Avenue, Phila. 32, Pa.

1. ***Non-Clog Impeller*** *has scraper blades on back to prevent accumulation of rags, matches, other solids. Impeller nut is countersunk to eliminate clogging.*
2. ***Heat-Treated Alloy Steel Shaft*** *is oversize to provide utmost rigidity even in heavy service. Precision ground, turned and finished.*
3. ***Two Double-Row Ball Bearings*** *carry thrust and radial loads. Generously sized for long bearing life, smooth pump operation. Deep-grooved, grease-lubricated.*
4. ***Oversize Stuffing Box*** *assures long packing life. Designed to prevent water leakage. Furnished with seal ring.*
5. ***Renewable Shock Absorber*** *prevents shaft deflection, protects bearings from shock due to pumping heavy, irregular objects. When abrasives are being handled, clear-water connection prevents excessive pump wear.*

Centrifugal, Axial and Mixed Flow Pumps • Steam Condensers • Vacuum Equipment • Marine Auxiliary Machinery • Nuclear Products

Allis-Chalmers equipment

Motors—Sizes used range from 300 hp to 700 hp. There are also two 1000-hp and two 900-hp hollow-shaft motors.



Motor Control—A-C motor control was used throughout. Shown is one group of Allis-Chalmers high voltage starters.

A-C ALLIS-CHALMERS

A-5787

powers gigantic

do-it-yourself
WATER PROJECT

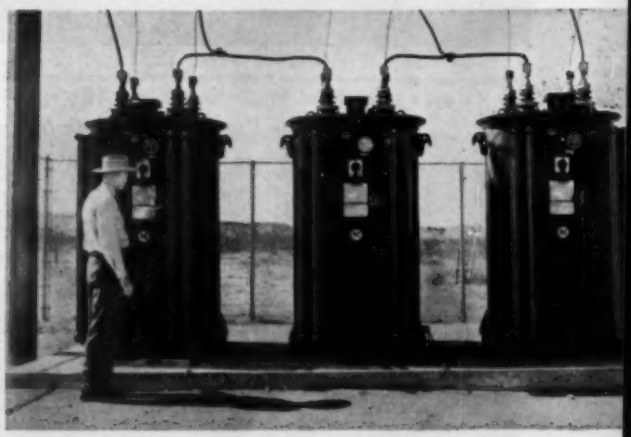
Water from man-made lake pumped to users in seven Texas counties

Down in Texas, where the unusual is commonplace, there's a man-made lake—with oil wells popping up from its surface! Texas—where oil flows like water, but flowing water is scarce — saw the creation of what is probably the world's largest do-it-yourself public works project. Lake J. B. Thomas was formed from the waters of the Colorado River, flooding an 8000-acre area.

The cities of Odessa, Big Spring and Snyder created a water district under State laws, and solved their serious water problem by the sale of revenue bonds, without any tax liability or Federal assistance. Ten billion gallons of water annually serve domestic and industrial customers and three oil well repressuring operations spread over seven counties.

More than 200 pieces of Allis-Chalmers equipment — motors, pumps, control and transformers—pump 36 million gallons of water daily through the two main pumping stations and booster stations along the 111 miles of pipelines. Multi-product engineering skills, normally calling for several manufacturers, are thus conveniently obtained from a single source.

Many progressive cities are benefiting from Allis-Chalmers range of products and all-around public works experience. *Your* city can, too. Call your nearest A-C office, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wis.



Pumps—Twenty-two pumps of various sizes are located at main pumping stations and booster stations along the 111-mile pipeline.

Transformers — 132 transformers, ranging in all sizes, distribute the power necessary to operate the equipment.

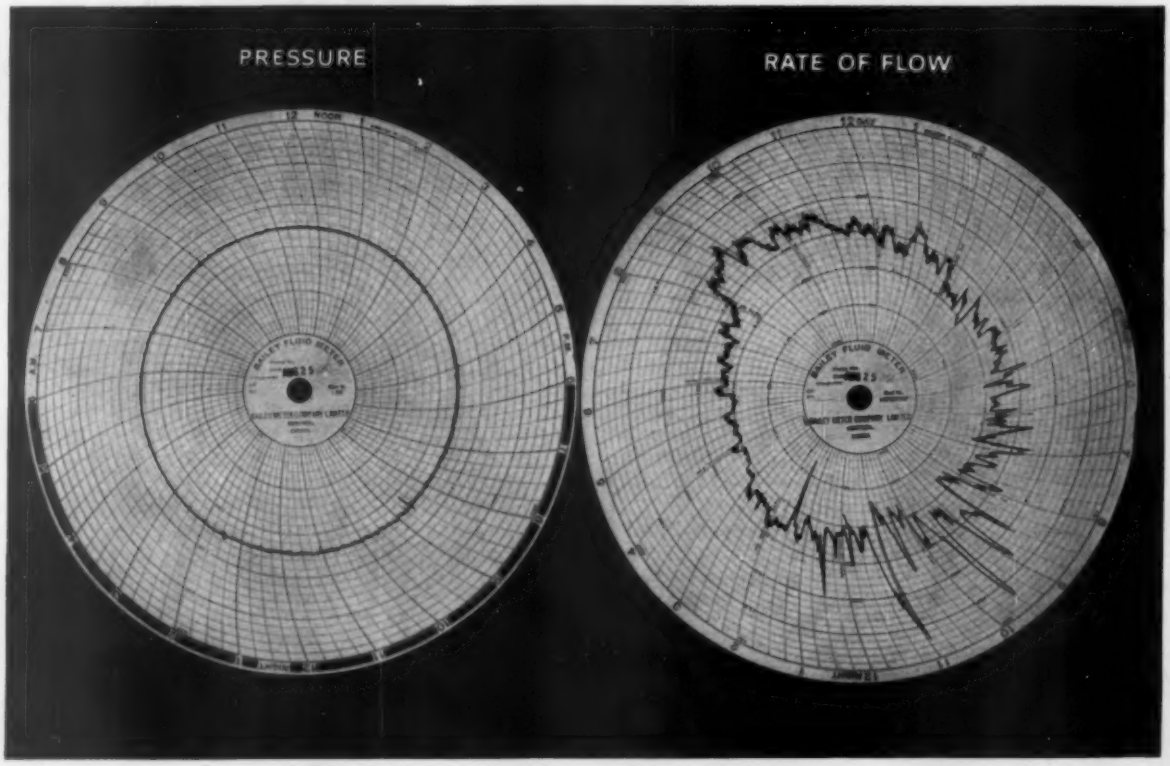
Allis-Chalmers public works equipment — Motor-generators, pumps, compressors, condensers, blowers, hydraulic turbines and generators, motors, transformers, switchgear, butterfly valves, diesel engines.

ALLIS-CHALMERS

Edmonton depends on Bailey!

Every hour of every day Edmonton, Alberta's water works maintains a constant water pressure . . . and BAILEY does it!

The Bailey Air Operated Control System automatically regulates two 15,000,000 Imperial Gallon capacity, variable speed, high lift pumps each fitted with a hydraulic coupling . . .



Here are the Pressure and Rate of Flow records from one of these high lift pumps. Note what happened at 10:55 p.m. on August 25th . . . the flow increased 10.2 M.I.G.P.D. (67% of pump capacity) almost instantaneously, and there was a momentary drop in pressure of only 5 psi!

During the 24 hours when these charts were being recorded only one variable speed pump was in operation . . . and its output represented approximately 20% of the total plant output.

Every minute of every hour, Edmonton's water supply depends on BAILEY!

W-7

WATER & WASTE TREATMENT DIVISION

BAILEY METER COMPANY

1071 IVANHOE ROAD • CLEVELAND 10, OHIO

In Canada—Bailey Meter Company Limited, Montreal

BAILEY METER

Equipment News

CONTINUED FROM PAGE 19A

like those of a conventional geared coupling, i.e., externally geared hubs are mounted on the shafts and joined flexibly by an internally geared sleeve. Power transmitting parts are steel and fully machined.

The MC coupling sleeve is one-piece design, and the coupling is enclosed in a two-piece metal cover, which is sealed to prevent loss of lubricant or entry of contaminants.

New Coagulant Aid Tested by USPHS

913

Allyn Chemical Co., Cleveland, O., has announced that their coagulant aid, Claron, was reviewed by the Public Health Service Technical Advisory Committee on Coagulant Aids for Water Treatment at the Robert A. Taft Sanitary Engineering Center in Cincinnati. On the basis of information submitted by the manufacturer, the Committee concluded that this product can be used for treatment of public water supplies with no adverse physiological effect upon water consumers when used in the recommended concentration, and provided the quality specifications furnished to the Committee continue to be met.

The Committee emphasized that its findings bear only on the health aspects of the use of this product and do not constitute its endorsement or indicate its effectiveness in proposed use.

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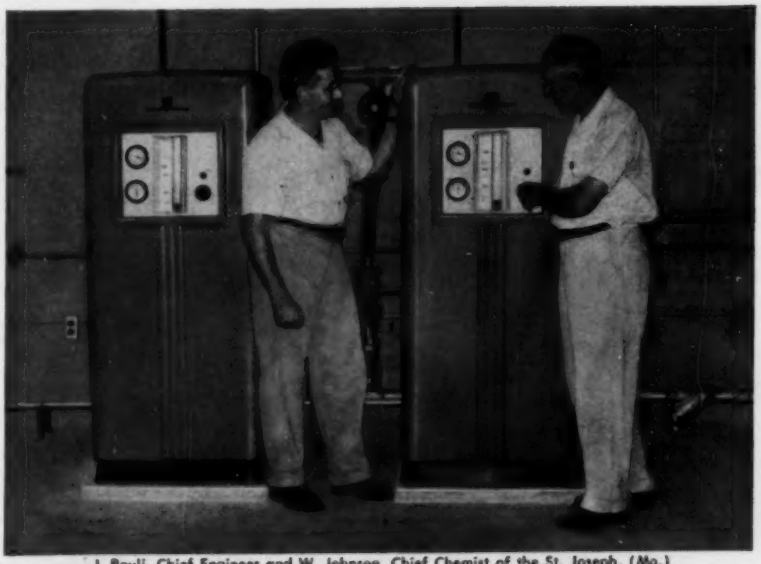


J. Pauli, Chief Engineer and W. Johnson, Chief Chemist of the St. Joseph, (Mo.) Water Company, discuss operation of their W&T V-notch chlorinators. The St. Joseph Water Co. is part of the American Water Works Service Co., Inc. system.

W & T V-notch Chlorinators— doubly accepted

The St. Joseph Water Co. found breakpoint chlorination the best way to treat Missouri River water. But this increased the range of chlorine requirements in the water treatment. W&T V-notch chlorinators were the answer.

W&T V-notch chlorinators have a chlorine feed range of 20 to 1 with an accuracy of 4%. Based on this acceptance at its St. Joseph plant, the American Water Works Service Co., Inc. has purchased V-notch equipment for use in other plants.

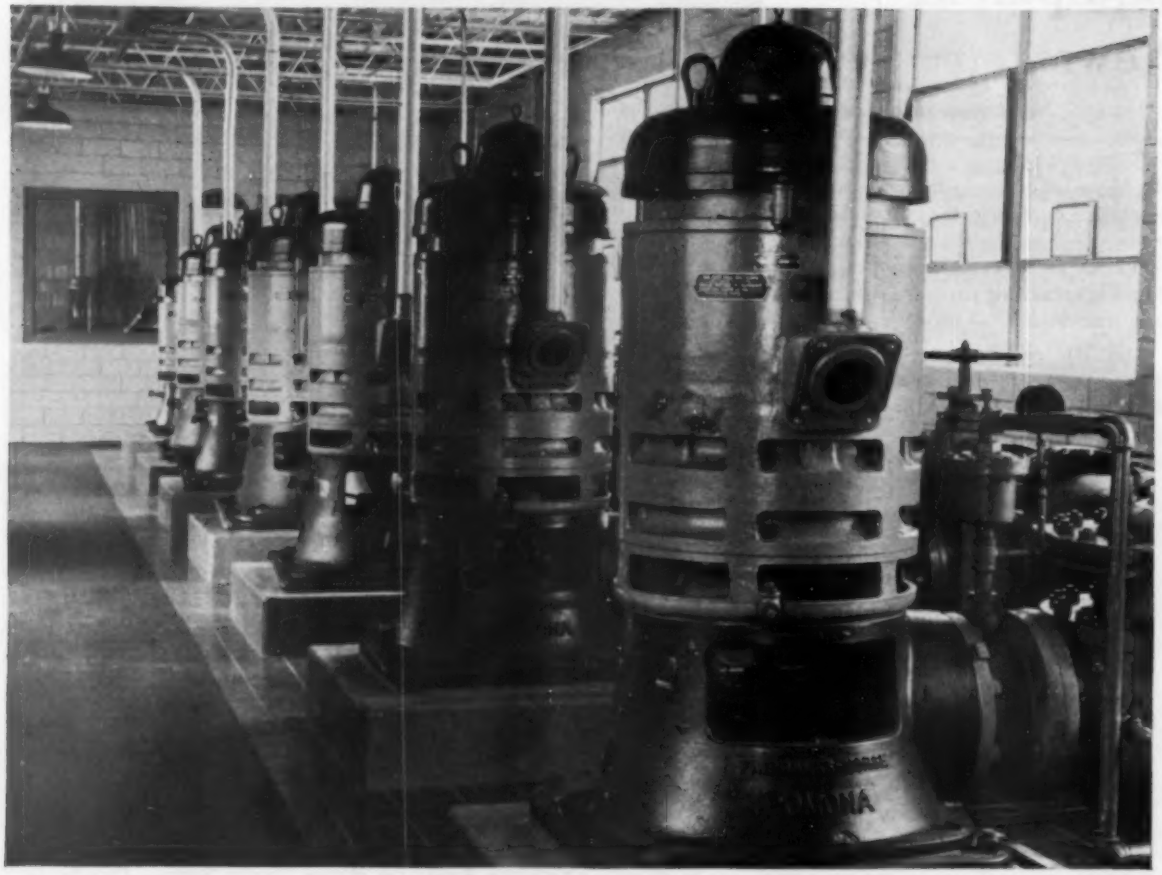
V-notch chlorinators are available to feed from 2½ to 8000 pounds of chlorine per 24 hrs. V-notch equipment also provides permanence and attractiveness through modern reinforced plastics. For comprehensive information about W&T V-notch chlorinators, write for Bulletin S-122.94.

WALLACE & TIERNAN INCORPORATED
25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

E. R. P. CATHODIC PROTECTION
...INDIVIDUALLY DESIGNED FOR EACH APPLICATION
to prevent corrosion of buried or submerged metal structures
Write for Bulletin E-37

ELECTRO RUST-PROOFING CORPORATION
30 MAIN STREET, BELLEVILLE 9, N. J.

• Eight of the new Fairbanks-Morse vertical turbine pumps at Midwest City, Okla.



Midwest City whips water shortage

Oklahoma metropolis installs Fairbanks-Morse pumps with automatic control—stops annual water problem

Thriving, expanding Midwest City, Oklahoma stands out as another city unwilling to let inadequate water facilities stagnate its future.

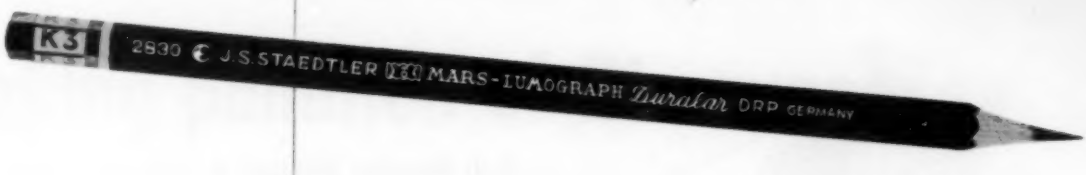
Until recently this city, too, was a victim of water shortage—particularly during peak summer months. Today Midwest City can point to modern water facilities capable of absorbing major growth. Wells have been drilled, new ground storage reservoirs constructed, more water mains laid, and a new pumping station built—equipped with eight motor-driven Fairbanks-Morse Pomona booster pumps with combined capacity of 7,500 gpm. The powerful, dependable F-M pumps are part of a telemeter automatic control system which permits selective operation from a central location.

By specifying all pumps and motors as Fairbanks-Morse in the new station, Midwest City has the cost-cutting advantage of one source of responsibility, plus complete interchangeability of parts for the future. No other manufacturer can match the experience of Fairbanks-Morse in providing pumps and drivers for both municipality and industry. Your Fairbanks-Morse Field Engineer will be glad to work with your own engineers in selecting the best equipment for your specific requirements.

FAIRBANKS-MORSE

a name worth remembering when you want the BEST

PUMPS • SCALES • DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY
COMPRESSORS • HOME WATER SERVICE EQUIPMENT • MAGNETOS



WON'T SMEAR ON MYLAR®!

Duralar

The only pencil

that **can't smear** on Mylar, that **keeps a point** on Mylar, that **erases** on Mylar. Duralar drawings on Mylar **reproduce** perfectly, **microfilm** without loss and can even be **cleaned** with soap and water.

For a free sample

send coupon below with business letterhead. Specify whether you wish included a test sample of matte-surface Mylar tracing film. See for yourself how the sensational new Mars Duralar solves your drafting problems. And Duralar is available (pencils, leads and lead holders) in five special new degrees of hardness (K1 to K5).

Sold only at engineering and drawing material suppliers.

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MARS

J. S. STAEDTLER, INC. HACKENSACK, N. J.

Gentlemen: Please send me FREE

☐ The revolutionary new DURALAR pencil
☐ Include a sample of Mylar film for testing the DURALAR pencil.

NAME _____ TITLE _____

FIRM _____

STREET _____

CITY _____ ZONE ____ STATE _____

Registered trademark of E. I. du Pont de Nemours & Co., Inc.

Ball Bearing Design. Reduces operating torque more than 50%! Less maintenance!

"O" Ring Seals. No stuffing box! Packless, dry-top design! Eliminates customary maintenance of packing. Greatly reduces friction while assuring complete, *permanent* lubrication of operating mechanism.

Direct-Acting Rod. Operates main valve without auxiliary connections. Made of special steel, sleeved with bronze at the "O" ring.

FEATURES OF ASSURANCE

with Darling B-50-B Hydrants

Extra Large Barrel. Delivers water at the nozzles with no appreciable pressure loss!

Integrated Main Valve Assembly. Designed for easy, complete removal of all working parts on the hydrant rod!

Positive Multi-Port Drainage. Unique design with automatic line-pressure flushing at every opening and closing makes stoppage or freeze-ups virtually impossible.

For complete details on the outstanding B-50-B hydrants, other major features, types, sizes, ask for Bulletin 5710.

TRADE DARLING MARK

DARLING VALVE & MANUFACTURING COMPANY

Williamsport 11, Pa.

Manufactured in Canada by The Canada Valve & Hydrant Co., Ltd., Brantford 7, Ont.

Curbing pollution of Biscayne Bay

LINK-BELT equipment mechanizes sludge collection and disposal at new sewage treatment plant

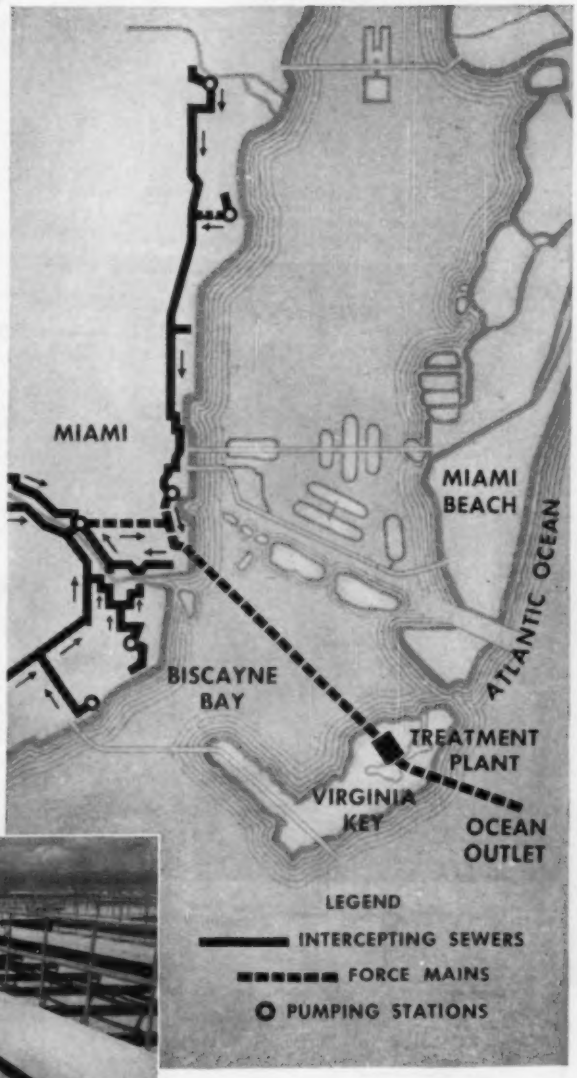
Miami's recent, rapid growth has multiplied the pollution problem throughout its bay area—crimping such activities as swimming, boating, water skiing and fishing. Miami has met this threat to its tourist economy with construction of a $27,000,000 sewage disposal project.

Inside and out, Miami's new activated sludge treatment plant utilizes sanitary engineering equipment by Link-Belt. A system of grit collectors with conveying screws and sludge collectors assists in low-cost treatment of sewage. Link-Belt bucket elevators carry liquid sludge to filters and belt conveyor . . . team up for efficient handling of the dewatered sludge. And Link-Belt Gearmotors and P.I.V. drives provide dependable power transmission for such equipment.

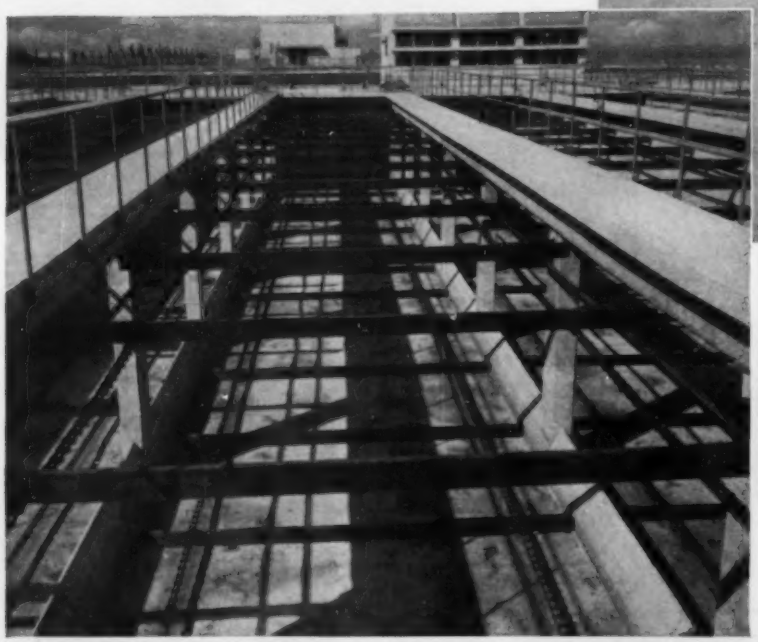
Link-Belt's complete line of equipment and broad engineering experience assure economical, effective water, sewage and waste treatment for municipalities and industries throughout the nation. A call to your nearest Link-Belt office will put you in touch with sanitary engineers who will work with your consultants and chemists.

LINK-BELT

SANITARY ENGINEERING EQUIPMENT



▲ **COMPLETE CONTROL PROJECT** provides interceptors, force mains and deep outfall line to deliver sewage to the Virginia Key activated sludge plant and to discharge plant effluent 4,600 feet out into the ocean. Design engineers were Rader Engineering Associates, Metcalf & Eddy and Maurice H. Connell and Associates, Inc.



◀ **BY THE DOZEN** — Here is just one of twelve Link-Belt Straightline sludge collectors operating in primary settling tanks at Miami's new plant. Sixteen Link-Belt Gearmotors drive sludge collectors and cross conveyors.

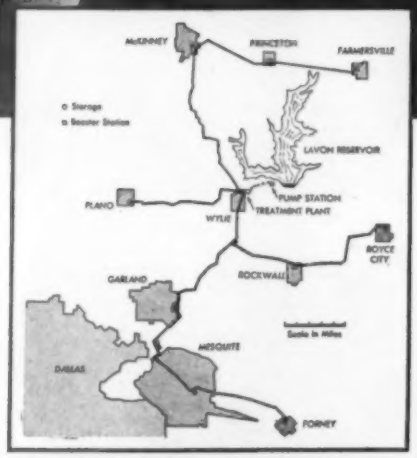
LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. Sanitary Engineering Regional Offices—Colmar, Pa., Chicago 9, Kansas City 8, Mo., San Francisco 24. Sales Offices in All Principal Cities. Export Office, New York 7. Representatives Throughout the World. 14,914

See our exhibit—Federation of Sewage and Industrial Wastes Association, October 5-9, Detroit, Michigan.

NORTH TEXAS
Municipal Water District, Wylie, Texas

Consulting Engineers:
FORREST and COTTON,
Dallas, Texas

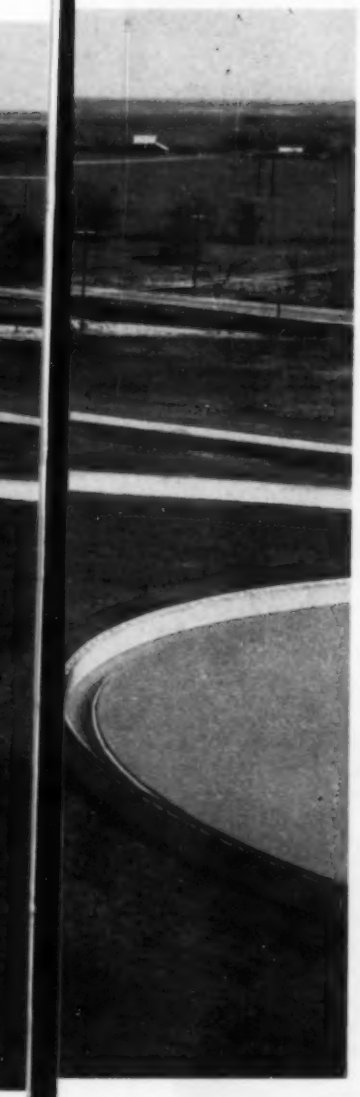
BUILDERS-PROVIDENCE CENTRAL CONTROL and telemetering panel at Wylie controls operation of pumps and valves in all three directions . . . using only two telephone circuits. This Synchro-Scan® feature effectively reduces monthly rates.



TEN MEMBER CITIES, with the City of Dallas as a customer, are efficiently and economically supplied with water taken from the Lavon Reservoir, treated at the Wylie plant, and fed out over the 92.4-mile network.

ONE SOURCE
ONE RESPONSIBILITY

BUILDERS-PROVIDENCE
DIVISION OF
B-I-F INDUSTRIES
METERS
FEEDERS
CONTROLS



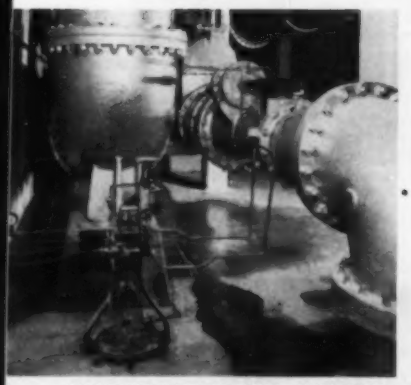
CONTROLS AND EQUIPMENT FOR TEN-CITY WATER SYSTEM SUPPLIED BY ONE MANUFACTURER

Builders-Providence given full responsibility for Controls on New $7,000,000 North Texas Municipal Water Treatment System

Selecting equipment and controls for an operation spreading over four separate counties is a major undertaking. A decisive factor in the choice of Builders-Providence was the ability and experience of this *one company* in supplying all equipment needed for telemetering and supervisory control, filter control, chemical feeding, and related functions.

ONE SOURCE — ONE RESPONSIBILITY integration permitted one field engineer to coordinate the installation and start-up of the entire system . . . centering full responsibility for its efficient operation. The result: better coordination, minimum installation costs, and greater systems reliability!

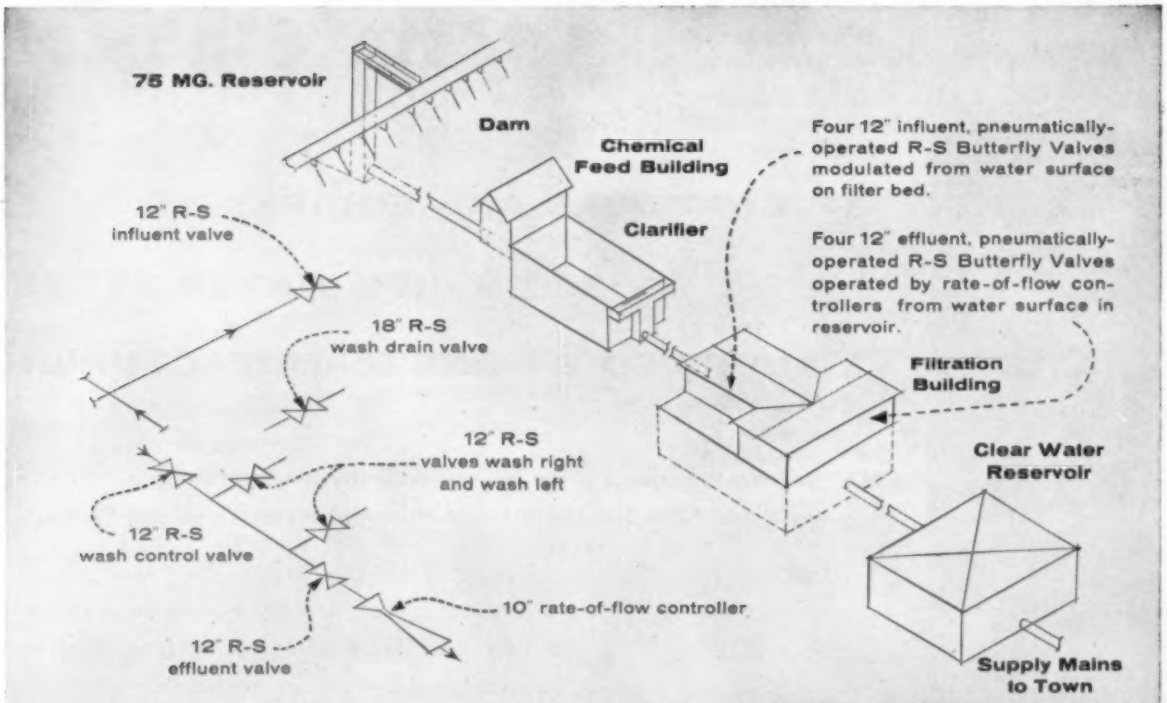
Save time, save money . . . with a single, responsible source . . . offering nation-wide sales and service through local offices. Write **Builders-Providence, Inc., 350 Harris Avenue, Providence 1, R. I.**



BUILDERS-PROVIDENCE PNEUMATIC MASTER CONTROL SYSTEM and rate-of-flow controllers provide dependable and instantaneous regulation of flows throughout entire system.

CONTROL PANEL in Dallas Pump Station continuously transmits local flows and levels to Wylie . . . from where Synchro-Scan master panel controls Dallas pumps to suit demands . . . further reducing operating costs.

OMEGA BELT GRAVIMETRIC FEEDERS and volumetric liquid feeders for treating water supply were manufactured by another division of B-I-F Industries, Inc.


75 MG. Reservoir
Dam
Chemical Feed Building
Clarifier
Four 12" influent, pneumatically-operated R-S Butterfly Valves modulated from water surface on filter bed.
12" R-S influent valve
Four 12" effluent, pneumatically-operated R-S Butterfly Valves operated by rate-of-flow controllers from water surface in reservoir.
18" R-S wash drain valve
Filtration Building
12" R-S valves wash right and wash left
Clear Water Reservoir
12" R-S wash control valve
10" rate-of-flow controller
12" R-S effluent valve
Supply Mains to Town

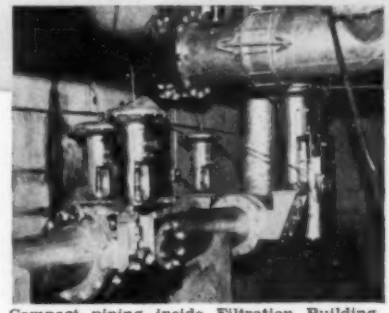
Diagrams of Durango Plant from sketches by Dale H. Rea, Consulting Engineer, Littleton, Colo., designer of the plant.

R-S Butterfly Valves used exclusively at Durango, Colorado,

TO GIVE CLOSE FLOW CONTROL

Durango, Colorado's 8.7 mgd water treatment plant operates automatically. But accurate flow control is necessary in this gravity system if the proper rate of flow in the treatment process is to be maintained. R-S Rubber-Seated Butterfly Valves were chosen to do this job. Their angle seating provides more desirable control characteristics. It means *more precise regulation over a greater range* than is available with 90° seated valves. 25 R-S Rubber-Seated Butterfly Valves, ranging from 12" to 18" in size, are installed here.

To obtain full information on the full SMS line – Butterfly Valves, Rotovalves and Ball Valves – contact our nearest representative or write S. Morgan Smith Company, York, Pennsylvania.



Compact piping inside Filtration Building shows rate-of-flow controller in left foreground, with wash and wash control valves behind it. This arrangement is diagrammed at left, above.

Two settling basins feed to Filtration Building in this 8.7 mgd system.

S. MORGAN SMITH HYDRODYNAMICS

AFFILIATE: S. MORGAN SMITH, CANADA, LIMITED, TORONTO

3

Rotovalves • Ball Valves • R-S Butterfly Valves • Free-Discharge Valves • Liquid Heaters • Pumps • Hydraulic Turbines & Accessories

Equipment News

CONTINUED FROM PAGE 23A

Improved Grouting Diaper

914

S&S Mfg. Co., St. Paul, Minn., has introduced a new grouting diaper designed to ease and expedite the sealing of pipe joints.

The new S&S Grouting Diapers are available in a range of sizes to fit any size and style of pipe and come in a choice of cotton or burlap. Sealing becomes a simple matter of tightening the grouting diaper around the circumference of the pipe joint and pouring in the grout mixture. Excess moisture drains off through the diaper fabric and the grout hardens to a perfect seal.

Miniaturized Line Locator

915

Wilkinson Products Co., Pasadena, Calif., has developed new, advanced design electronic locators for determining the precise location and depth of all sub surface structures—mains, services, transmission lines, valves, boxes, cables, etc.

This new model Wilkinson Line Locator is encased in a molded glass fibre container which provides ultimate protection for rough field use. The dimensions of this instrument are one fourth that of conventional locating devices and the overall weight has been reduced to four pounds. The miniature leak proof mercury cells have a use life at least ten times ordinary batteries. The transistors, as well as other components are soldered into the circuitry insuring freedom from the usual servicing. The transistors have a rated use life of 70,000 hours, which means many years without replacement. A telescopic connecting handle of anodized aluminum and a transistorized single ear set completes the set.

New 2-Speed "Hi-Lo" LimiTorque Actuator

916

Philadelphia Gear Corp., Philadelphia, Pa., has developed a 2-speed "Hi-Lo" LimiTorque Actuator.

LimiTorque now has available a

CONTINUED ON PAGE 33A

Hardinge CLARIFIERS for circular tanks

Two Hardinge 100'-diameter, center-column final clarifiers at the municipal sewage disposal plant in York, Pennsylvania. (Albright and Friel, consultants)

Hardinge Clarifiers and Thickeners are being used in:

- SEWAGE TREATMENT PLANTS for primary and final clarification and sludge thickening.
- INDUSTRIAL WASTE TREATMENT of all types.
- WATER TREATMENT, industrial and public.

A wide selection of sizes and arrangements is offered:

- Normal duty and "Auto-Raise" heavy duty mechanisms.
- Beam, truss and center-pier supported units.
- Side feed and under feed.
- Spiral and segmented rakes.
- Mechanical, hydraulic or electrical overload protection.

Detailed specifications for all types and sizes are available upon request. Bulletin 35-D-15.

HARDINGE
COMPANY, INCORPORATED

YORK, PENNSYLVANIA • 240 Arch St. • Main Office and Works

New York • Toronto • Chicago • Hibbing • Houston • Salt Lake City • San Francisco

Guthrie Water Works Operators...

DIAL the FLOW RATE... then forget it!

Control panel for one of Guthrie, Oklahoma's, 4 Rapid Sand Filters. Instrument dials (L to R) show loss of head, effluent flow, and rate of backwash. Air switches at bottom are used to shift control functions.

thanks to FOXBORO PNEUMATIC CONTROL

"Dial the set point and flick a pneumatic switch". That's how they control effluent and backwash on rapid sand filters at the new Guthrie, Oklahoma, Water Treatment Plant. No valves to crank — no need to check the filters visually! Foxboro does it all quickly, dependably — automatically.

With Foxboro centralized Rapid Sand Filter Control, filtration rates can be set: remotely, from a panel in the operating gallery (as at Guthrie); or, automatically, from a sedimentation basin or clear well.

Find out how Foxboro Pneumatic Control can save you time, and money. For full details, write for illustrated Bulletin 1-15A. **The Foxboro Company, 899 Neponset Avenue, Foxboro, Massachusetts.**

FOXBORO
REG. U.S. PAT. OFF.

AUTOMATIC CONTROL FOR RAPID SAND FILTERS

Guthrie's modern new water treatment plant has Foxboro instrumentation on each of its Rapid Sand Filters. City manager R. O. Whitchurch says, "We're impressed with the speed of Foxboro control, and with the time it has saved our operators."

Equipment News

CONTINUED FROM PAGE 31A

complete new design "Hi-Lo" 2-speed attachment, which is a magnetic clutch actuated gear reduction unit. The "Hi-Lo" attachment is mounted between the motor and the LimiTorque housing, and permits operation at either of 2 "speeds," and is capable of changing speeds under load. It permits hi-speed valve operation and still retains the slow speed seating characteristics required by most valves.

The "Hi-Lo" attachment permits as high as 18:1 ratio in speeds, and is controlled either by pre-set limit switches or relays mounted in the LimiTorque Operator or by other control devices located on associated equipment furnished by us or others.

The "Hi-Lo" attachment to the LimiTorque Valve Unit makes it ideal for the special requirements of water works, oil refineries, and sewage treatment plants, etc., where normal operating conditions require low or medium speed operation, but under emergency conditions fast speed operation is a must. Line surge or hammer is reduced under emergency hi-speed operation by changing to low speed operation prior to seating.

New High Activity Flocculant

917

The Dow Chemical Co., Midland, Mich., has announced a new, high-activity, polyacrylamide-type flocculating agent, Separan NP20, has been added to its family of flocculants.

Separan NP20 is "the most active material available on a unit weight basis," the announcement said.

"This means that less flocculating material may be used, or the same amount of material will provide more flocculating activity in a given application."

The new material is now available in commercial quantities.

Separan NP20 is a synthetic, organic, water-soluble, high molecular weight polymer which is manufactured as a white amorphous flake. It has uniform effectiveness over a wide pH range.

INSTALLING 15,000 feet of 4" to 8" pipe in the Sundale Subdivision, Washington, Illinois, being built by Richmond Home Builders. Wiegand & Storrer lay approximately 2400 feet of pipe per day.

"We lay 400% more pipe per day" —WIEGAND & STORRER

"In 1956 we replaced a backhoe with a Buckeye '307' ditcher. Now we lay 400% more pipe per day! Our Buckeye ditcher leaves a neat, continuous spoil bank that means easy, low-cost ditch backfilling. We chose the '307' over 3 other makes because it had a hydraulic hoist, simple controls and 3-speed hydraulic conveyor. Maintenance costs have been exceptionally low. We know our Buckeye ditcher was a wise choice."

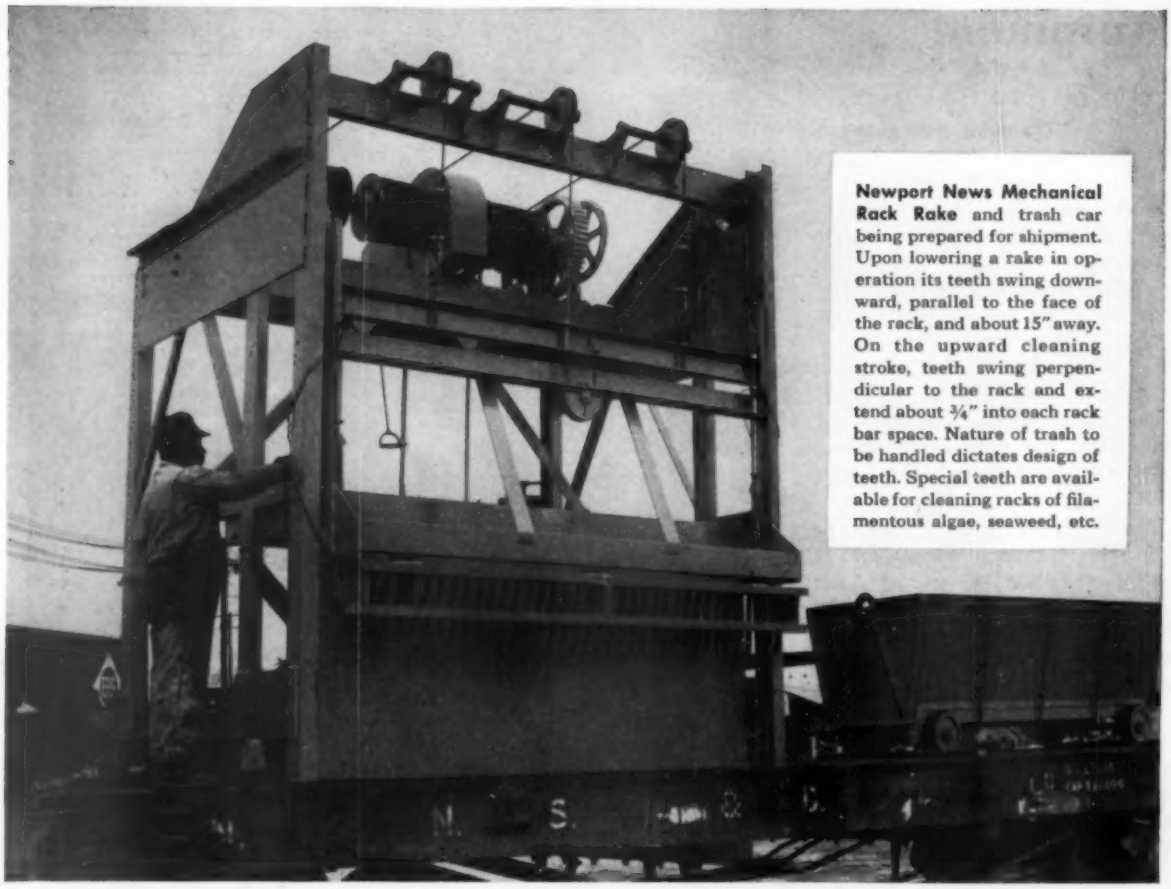
WIEGAND & STORRER
Rt. 6, Peoria, Illinois

GarWood
INDUSTRIES, INC.
Wayne, Michigan • Findlay, Ohio

Gar Wood Excavators

Gar Wood Winches

Gar Wood–St. Paul Hoists & Bodies



Newport News Mechanical Rack Rake and trash car being prepared for shipment. Upon lowering a rake in operation its teeth swing downward, parallel to the face of the rack, and about 15" away. On the upward cleaning stroke, teeth swing perpendicular to the rack and extend about ¾" into each rack bar space. Nature of trash to be handled dictates design of teeth. Special teeth are available for cleaning racks of filamentous algae, seaweed, etc.

Positive cleaning action calls for guided rack rakes

Excessive loads of trash cannot push a Newport News rake away from the racks.

And there's no chance of the rake *riding over trash* on the upward cleaning stroke. Nor will its teeth drop the debris. Because Newport News builds the rake to operate in channel guides... for *positive cleaning action.*

That's why efficient rack cleaning assures the maximum head at intakes and is yours when you put a rugged and dependable Newport News Mechanical Rack Rake on the job.

Maximum width of a single rake is determined by design of the forebay. Where a single bay is extremely wide, intermediate guides are sometimes installed to reduce width of the rake. Such installation is relatively inexpensive.

A power-operated Newport News Mechanical Rack Rake, under ordinary conditions, enables one man per shift to keep racks clean for a dozen bays, from 5'-6" to 28'-6" in width.

Trash is cleaned from the rake manually, or by a mechanical "sweep", into a flume, a car or onto a trash apron. Local conditions and nature of the trash dictate method of disposal. The many typical installation arrangements fit most needs, but each installation is a custom built job.

We invite inquiries from water users who are troubled with trash. Write for your copy of "RACK RAKE", an illustrated booklet describing the operation and advantages of the Newport News Mechanical Rack Rake.

Newport News
Shipbuilding and Dry Dock Company
Newport News, Virginia

New Bulletins *AVAILABLE FREE*

Condensation Prevention

918

J. W. Mortell Co., Kankakee, Ill., has available a 32-page handbook that gives complete general and technical data on condensation and corrosion.

The booklet also discusses how No Drip plastic coating controls condensation and provides an insulation type coating in plastic form that permanently protects metal, concrete, wood or composition surfaces.

Benefits of Asbestos-Cement Pipe

919

Keasbey & Mattison Company, Ambler, Pa., has just published a brochure which presents the advantages and features of asbestos-cement pipe and stresses the importance of "clear, full-flowing water—a community's most important asset!"

Intended for those contemplating the installation of water pipe in their communities, the pamphlet details the advantages of asbestos-cement pipe and highlights its ability to retain its original smooth bore through years of service. Dimensional data are also included.

J-M Moulded Packings

920

Johns-Manville, New York, N. Y., has just published a concise 12-page catalog on moulded packings that offers the type of information a designer wants to know about the selection and installation of sealing devices for pneumatic and hydraulic equipment.

It first covers the material types recommended for the various pressure ranges and service classifications. Then, it provides brief descriptions and cross-sectional illustrations of each packing with needed textual, tabular and diagrammatic application data.

Sealing devices covered include the three J-M "square heel design" Cup Packings for piston and rod applications: "U" Cups, "A" Cups and Hat Cups. Also shown is Johns-Manville Uneepac, the automatic lip packing with the unique cross-sectional design for multiple ring set applications, especially those with minimum depth requirement.

Other J-M automatic packings described and illustrated include J-M V-Rings for rods and pistons, which are characterized by a design engineered for maximum strength, flexibility and sealing sensitivity; and J-M Sea Rings the "old timers" with the husky design primarily suited to deep stuffing box applications.

Motor Instruction Manual

921

To help pump dealers and maintenance men to save time and needless procedures in installing, inspecting, and servicing its Verticlosed pump motors, U. S. Electrical Motors, Inc., Los Angeles, Calif., has just published a liberally illustrated and charted Instruction Manual covering both Verticlosed Type CFU, Oil-Lubricated,

CONTINUED ON PAGE 37A

The largest water tank repair company in the United States is at your service. Repairs guaranteed for 12 years . . . interior paint guaranteed for 3 years . . . exterior painting guaranteed for 6 years.

Representatives in every state of the Union.

DIXIE TANK'S "SYMBOL" OF YOUR PROTECTION

DIXIE TANK & BRIDGE CO.

Please write or wire us for more information.

3523 LAMAR AVENUE

MAILING ADDRESS: P. O. BOX 14, MEMPHIS 1, TENN.

OLIVER

MODEL 80 HYDRO-TRENCHER

Rough ripping or ticklish digging

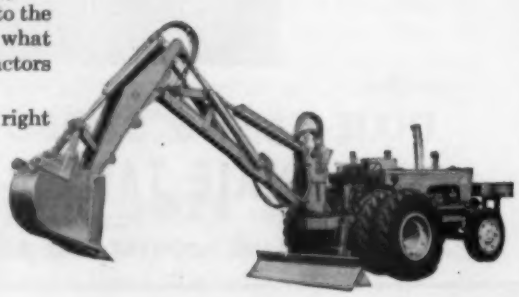
It's all the same to this versatile one-man rig, ready to handle all kinds of excavating and trenching assignments.

Powerful hydraulic pressures give you the ability to rip out pavements or to dig through the toughest soils, even frozen ground. Yet controls are so accurate and sensitive that you can "feel" your way in difficult spots to avoid damage to existing pipes, work close to foundations, etc., with maximum speed and safety.

With its amazing job-ability, the Model 80 Hydro-Trencher gives you rubber-tire mobility to travel anywhere on busy streets, get to the job in a hurry and work fast, achieving lower costs. That's what makes it a real favorite with municipalities, utilities and contractors alike.

Your dependable Oliver distributor will gladly demonstrate right on your own job. Call him today. Or write for literature.

OLIVER Model 80 Hydro-Trencher—available with gas or diesel power, six forward speeds to meet every need for travel and power. Dual hydraulic controls permit raising or lowering bucket while swinging to give you a fast digging cycle. Here's bigger production than you'll get with ordinary equipment of this type.



OLIVER

THE OLIVER CORPORATION

Industrial Division, 19300 Euclid Ave., Cleveland 17, Ohio

a complete line of industrial wheel and crawler tractors and matched allied equipment

New Bulletins

CONTINUED FROM PAGE 35A

and Type SCU, Grease-Lubricated Motors. It outlines in careful, easy-to-understand steps various factory-developed procedures that are designed to minimize the dealer's and maintenance man's servicing efforts.

Detailed installation instructions are given on mounting, oil-fill, electrical connection, mechanical connection, and the use of upthrust protection where needed. Operating instructions include guidance on ventilation, first-time starting and stopping check-list, shutdown protection, and lubrication directions for both oil-filled and grease-filled motors. A full page is devoted to tables of recommended oils and recommended greases, listing the manufacturer and trade name of each.

A convenient two-page trouble-shooting chart gives symptoms, along with probable cause and remedy, for such contingencies as motor failing to start, failing to come up to speed, running hot, vibrating, or running noisily.

Other main subjects covered by the manual include maintenance and repair, disassembly and reassembly steps and charts, inspection techniques, and parts reference lists.

Residual Chlorine Analyzer

922

Fischer & Porter Co., Hatboro, Pa., has just published a technical publication on their Residual Chlorine Analyzer, a double light beam filter photometer for continuous measurement of free, combined, or total residual chlorine in water or sewage.

Full description, technical details and specifications are also included.

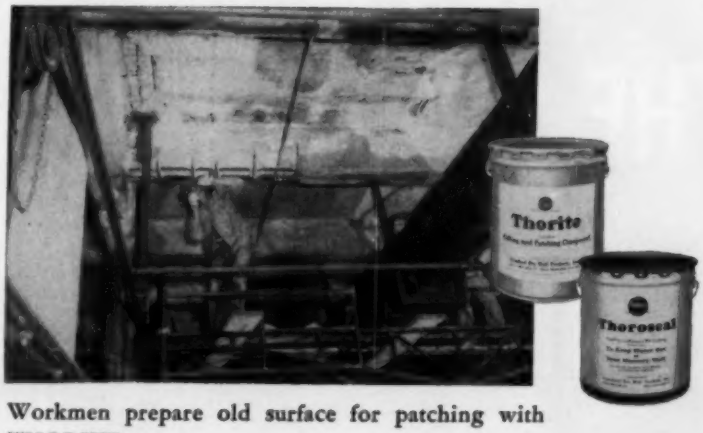
Check Chart For Maintenance Painting

923

The Wilbur & Williams Co., Brighton, Mass., has just issued the fourth edition of its famous Check Chart to bring up to date the latest technical recommendations on selecting the right paint for maintenance problems. Included in application rec-

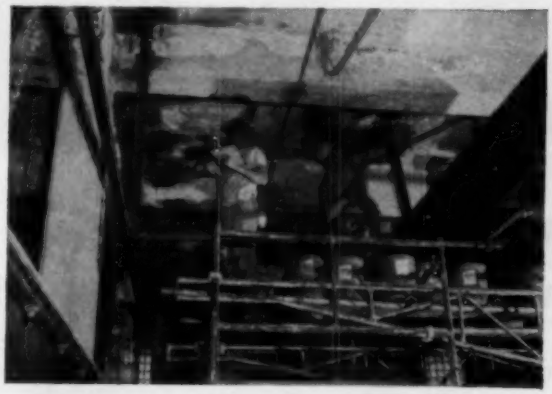
CONTINUED ON PAGE 39A

How THORITE and THOROSEAL made this underground structure sound again!



Workmen prepare old surface for patching with THORITE.

Water has entered the concrete and caused corrosion of reinforcing rods, blistering the concrete off surface and causing structural weakness throughout building.

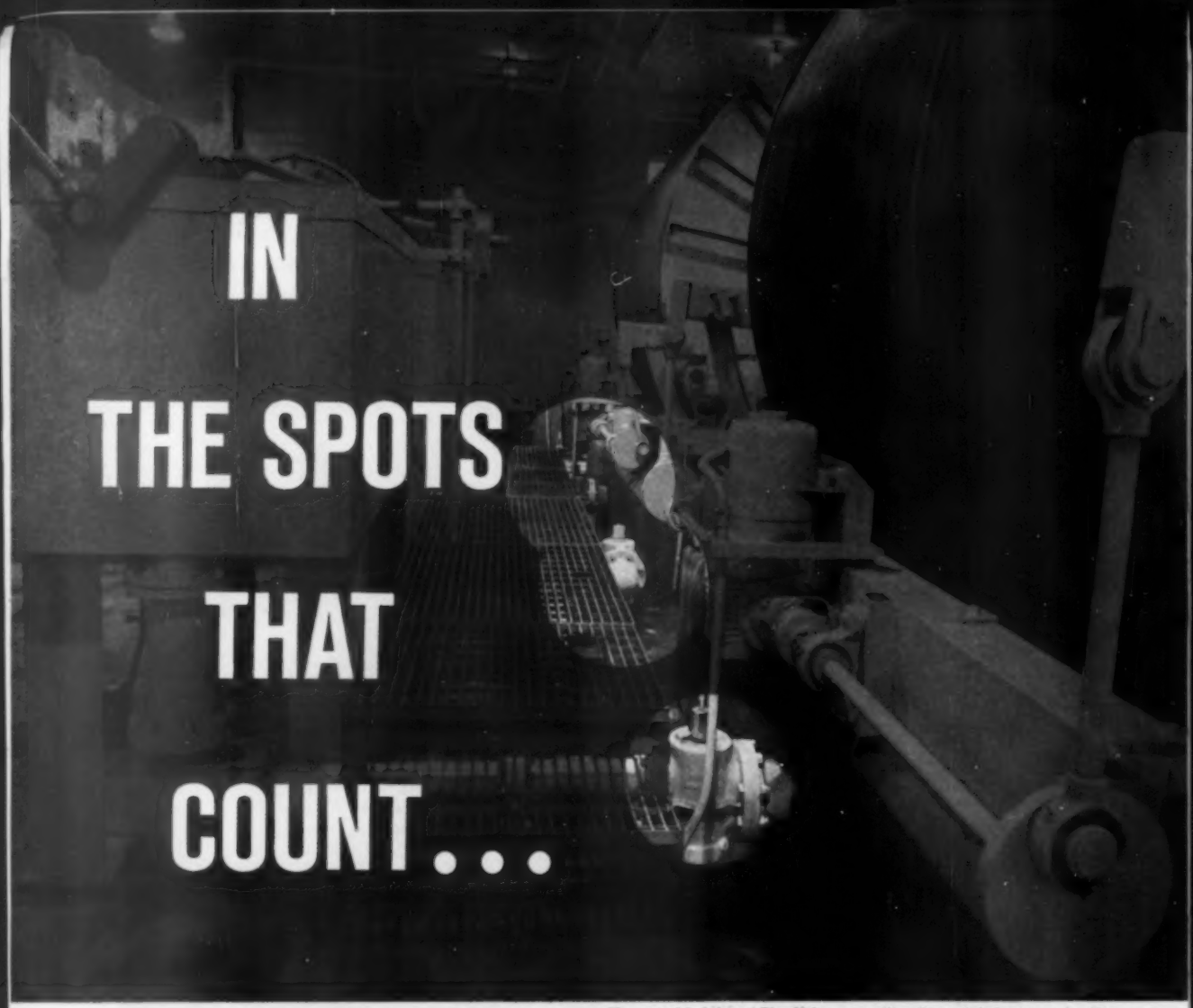


Reinforcing was cleaned, all corrosion was removed and brush coat of THORITE applied over entire patching area, then filled in with trowel coats of THORITE, even with surrounding surfaces.

THORITE Patching Mortar sets in 20 to 30 minutes and can be coated with THOROSEAL while hardening.

"How to do it" GET OUR 16 PAGE BROCHURE

STANDARD DRY WALL PRODUCTS, INC.
NEW EAGLE, PENNA. CENTERVILLE, IND.



Homestead Lubricated Plug Valves controlling digested sludge to vacuum filters.

Sewage plants make important savings in maintenance costs with Homestead Valves

Pump overloading resulting from restricted port area valves is eliminated by the 100% pipe area of Homestead Lubricated Plug Valves.

This, coupled with Homestead's controlled pressurized lubrication and positive chemical seal, results in years of trouble-free, low cost service. Study of your pipe lines will reveal many instances when Homestead Valves can help you achieve lower maintenance costs. Write today for complete information.

hv

HOMESTEAD VALVE MANUFACTURING COMPANY
P.O. Box 42 • Coraopolis, Pennsylvania

Please send me catalog on Homestead Lubricated Plug Valves. We are interested in this specific application:

.....

.....

Name.....

Street.....

City.....Zone.....State.....

New Bulletins

CONTINUED FROM PAGE 37A

ommendations are products based on many of the newest resins, such as Hypalon, Polyurethane and Saran, as well as rubber and vinyl combination.

This Check Chart is used as a standard reference work by paint users of all types to determine which paint products to select to solve specific maintenance conditions and how to compare available paints offered for such conditions.

This Check Chart outlines many problems common to industry and recommends the type of coating to solve such problems.

Liquid Level Controls

924

B/W Controller Corp., Birmingham, Mich., has released a new catalog describing the B/W system of Liquid Level Control which operates without floats and with no moving parts in the liquid. The catalog covers B/W liquid level relays, electrodes, signals, alarms, and alternators, with descriptions, charts and diagrams of typical applications. Panels for liquid level and industrial controls are also included.

Magnetic and Motorized Valves

925

The Mercoid Corp., Chicago, Ill., has just released a 24-page catalog that illustrates and lists specifications of magnetic and motorized valves for use with air, water, gas, steam, oil and refrigerants. Also included are solenoid coil rating tables.

Another feature consists of two flow charts—one for liquids, the other for compressible fluids. Dimensional drawings are included.

Rubber Expansion Joints and Flexible Pipe

926

General Rubber Corp., Tenafly, N. J., has just released a new 6-page, 2-color bulletin giving complete information on their new line of high quality Rubber Expansion Joints and Flexible Pipe.

According to the bulletin GRC Expansion Joints and Flexible Pipe are available in three styles: (1) Style 1000—For Vacuum Operation, (2) Style 1025—For Pressure Operation; and (3) Style 1050—For Vacuum and Pressure Operation. Standard pieces are recommended for working temperatures to 180° F and pressure to 150 psig, or 30" Hg vacuum service. Higher temperature and pressure GRC units are available for special service.

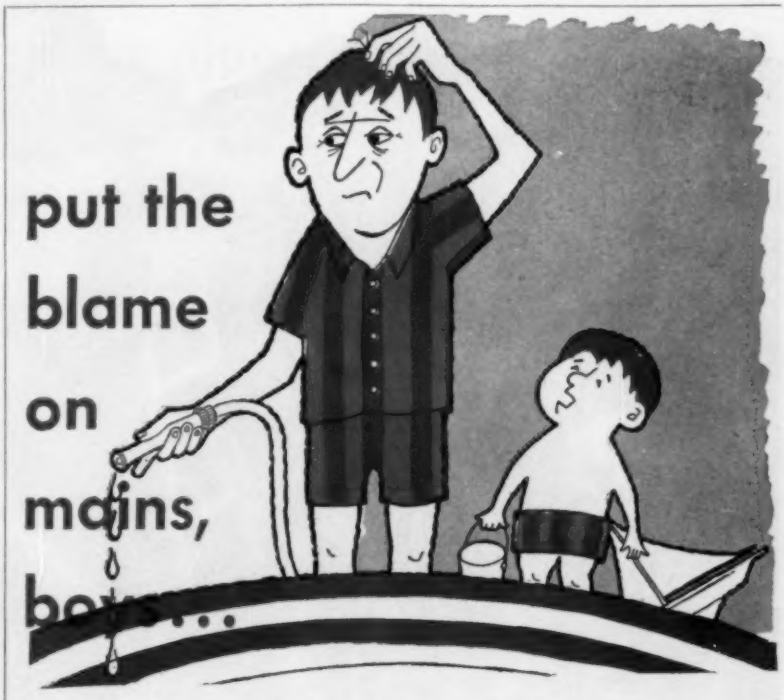
Blowers For Vacuum Service

927

Roots-Connersville Blower, Division of Dresser Industries, Inc., Connersville, Ind., has just published a new bulletin covering the complete line of cycloidal blowers for vaccum service. The bulletin presents detailed design and construction data as an aid to proper application of this equipment in a wide range of process industries.

Also included is full information on

CONTINUED ON PAGE 43A



Did you hear a lot of customer complaints about low water pressure last summer? After the spring's heavy rains which filled reservoirs to the brim all over the country, *there should be no water shortage.* The problem probably rests underground . . . mains and distribution grids choked by pressure-killing tuberculation and corrosion.

There's one sure cure for your pressure problem . . . the Centriline Process. Centrilining permanently increases carrying capacities in all sizes of pipe by eliminating tuberculation and corrosion forever. After loose scale and tubercules are removed from the pipe, the Centriline machine applies a smooth, uniform coating of cement-mortar to the pipe wall by centrifugal force. Fast and economical, Centrilining is accomplished with a minimum of interruption to surface traffic, since the pipes are lined in place and excavations are not required at laterals and services.

With the introduction this year of the new, small diameter Centriline machine, you can permanently protect all water lines from 4 to 144 inches in diameter. Send today for our new brochure which fully describes the Centriline Process.

CENTRILINE CORPORATION

A Subsidiary of Raymond International Inc.

140 Cedar Street
New York 6, N. Y.
WOrth 2-1429

Branch Offices in Principal Cities of the United States, Canada and Latin America.

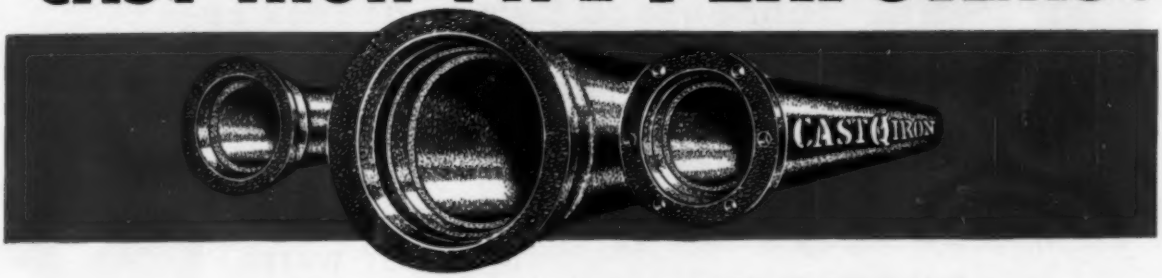
ANY PIPE CAN PROMISE...

50 YEARS YOUNG! This 36" Cast Iron Pipe feeder main was installed in 1907. Taken up in 1954 because of relocation project, it was relaid in 1956 for a bypass line around new highway interchange.

Close-up of section of above pipe 1,958 feet of which was cleaned and reused.

MODERNIZED cast iron

CAST IRON PIPE PERFORMS!



What other pipe offers you LONG LIFE + STRENGTH + HIGH FLOW CAPACITY?

Don't doubt when you buy pipe—specify cast iron and be sure of...

1. **LONG LIFE...**
   42 North American cities are still using cast iron water mains laid 100 years and more ago. Hundreds more have passed the 50 year mark.
2. **BEAM STRENGTH...**
   Cast Iron Pipe is inherently tough... stands up under heavy traffic load, soil displacement and disturbance.
3. **HIGH FLOW CAPACITY...**
   Cement lined cast iron pipe and fittings will not tuberculate... delivers a full flow for the life of the pipe.
4. **EXTERNAL LOAD RESISTANCE...**
   6" Class 150 Pipe withstands a crushing load of 17,900 pounds per foot... nearly 9 tons.
5. **CORROSION RESISTANCE...**
   Cast Iron Pipe effectively resists corrosion... vital factor in its long life and dependability.
6. **TIGHT JOINTS...**
   A full range of leak-proof, low cost, easy-to-assemble joints for pipe and fittings are available for all conditions.

You've read and heard thousands of words—all selling pipe.

But make no final choice before you ask this simple question: What pipe offers you not one, not two but *all* the factors that spell long, trouble-free life and dependability.

The answer is... cast iron pipe. Performance made it... and performance keeps it... America's No. 1 Water Carrier.

Its service record *proves* it!

THE MAN WHO CHOOSES CAST IRON PIPE TODAY WON'T PAY FOR IT AGAIN TOMORROW!

CAST IRON

Cast Iron Pipe Research Association
Thos. F. Wolfe, Managing Director
Suite 3440, Prudential Plaza, Chicago 1, Ill.

pipe FOR MODERN WATER WORKS

2 PROVEN WAYS
to measure better at less cost!

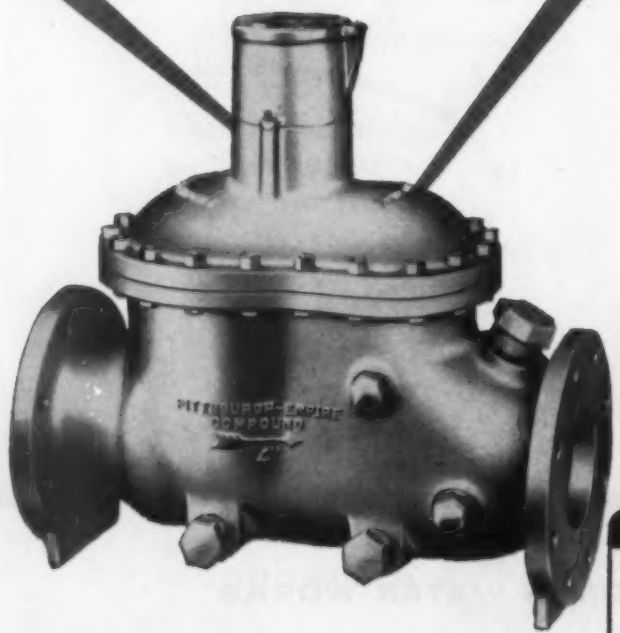
ROCKWELL
Sealed Register
METERS

WITH POWERFUL MAGNETIC DRIVE

NO FOGGED REGISTERS
NO STUFFING BOXES
NO LEAKS OR BINDS

SEALED FOREVER AGAINST WATER, DIRT, FOGGING!

ONLY ONE REGISTER TO READ!



ROCKWELL
Single Register
COMPOUND METERS

FASTEST READING

LIGHTEST—EASIEST TO HANDLE

MANIFOLD COMPACTLY

(Complete 2-meter assemblies available)

BENEFIT NOW from these *exclusive* developments of Rockwell Research by the most progressive company in the industry. Write for descriptive bulletins. Rockwell Manufacturing Company, Pittsburgh 8, Pa.

WATER METERS

another fine product line by

ROCKWELL

New Bulletins

CONTINUED FROM PAGE 39A

construction, and technical data on capacities and ratings, many of which have been recently increased. A feature is a full-color cutaway view of the R-C Cycloidal blower which clearly shows the design features of the equipment. The completeness of the bulletin makes it possible for an engineer to make an initial selection of equipment on the basis of the data presented.

Slip Joint Clay Pipe

928

Robinson Clay Product Co., Akron, Ohio, has just released a completely new folder describing the company's Slip-Joint Clay Pipe. Designed for quick reference, this fully illustrated folder contains data on handling and installation of Robinson Slip-Joint Clay Pipe, with special emphasis on Slip-Joint fittings for all installation requirements.

Ion Exchange Regeneration

929

Graver Water Conditioning Co., New York, N. Y., has a new technical reprint on ten methods of ion exchange regeneration.

The paper points out that no matter what type of demineralizer plant is used, the properly selected regeneration method must provide the right amounts of chemical, proper concentrations and sufficient contact time with exchangers.

The article tells how each of the ten methods work and what controls and equipment are required in each case. Methods discussed run from the earliest types to more modern practices. Each of the methods is illustrated.

Corrosion Resistant Plastic Equipment

930

Haveg Industries, Inc., Wilmington, Del., has just issued a bulletin which describes the selection of the proper plastic for each and every chemical corrosion problem. Such

CONTINUED ON PAGE 52A

TC TENNESSEE CORPORATION

Ferri-Floc FERRIC SULFATE

Ferri-Floc
FERRIC SULFATE

The Superior COAGULANT With The Plus FACTORS—

- Excellent taste and odor control
- Increased filter runs
- Coagulation over wide pH ranges
- Rapid floc formation
- Economy
- Turbidity removal
- Color removal
- Manganese and Silical removal
- Bacteria removal
- Ease of Operation

Ferri-Floc gives smoother, more efficient and trouble free operation. Whatever your particular water treatment problem may be, you can depend on Ferri-Floc doing a superior job and doing it efficiently and economically—Ferri-Floc is a free flowing granular salt which can be fed with few modifications through any standard dry feed equipment. It is only mildly hygroscopic, thereby permitting easy handling as well as storage in closed hoppers over long periods of time.

WATER TREATMENT

Efficient coagulation of surface or well water. Effective in lime soda-ash softening. Adaptable to treatment of all industrial applications.

SEWAGE TREATMENT

Ferri-Floc coagulates wastes over wide pH ranges — It provides efficient operation regardless of rapid variations of raw sewage — Is effective for conditioning sludge prior to vacuum filtration or drying on sand beds.

SULFUR-DIOXIDE is effectively used for dechlorination in water treatment and to remove objectionable odors remaining after purification.

COPPER SULFATE will control about 90% of the microorganisms normally encountered in water treatment plants more economically than any other chemical.

FREE BOOKLET

Let us send you without charge, a 38 page booklet that deals specifically with all phases of coagulation—just send us a postal card.

TENNESSEE TC CORPORATION

617-29 Grant Building, Atlanta, Georgia

is the big extra you get with Honeywell Instrumentation

Whether you buy a replacement part, a single instrument or a complete control system from Honeywell, you get service that no other instrument manufacturer can match for completeness.

It is service that begins when you first decide you need instruments, and continues long after they're installed. It includes:

- Preliminary engineering, even before specifications are written.
- Application engineering for installation and startup.
- Service engineering help from your nearby Honeywell branch, which has a completely staffed installation department.
- Service and instruction manuals with each order.
- Periodic service and swift help in emergencies.
- Ready availability of parts and accessories from branch offices and Honeywell's Central Supply Depot.
- Training of your operators at the tuition-free Honeywell Instrumentation Education Center.

Your nearby Honeywell field engineer will be glad to discuss this service in light of your particular needs. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

Honeywell

First in Controls

Connect Branch Mains...

QUICKLY SAFELY SIMPLY *under pressure!*

MUELLER® Tapping Sleeves and Valves are your most practical—and economical—means of connecting lateral or branch mains.

Connections are quickly made under pressure with the new Mueller CL-12 Drilling Machine—*there is no shutdown, no loss of water, no interruption of flow in the main!*

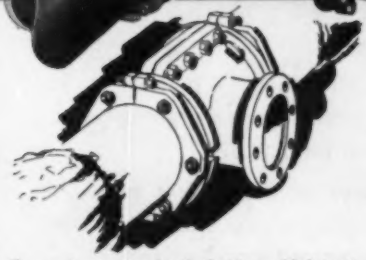
Mueller Tapping Sleeves are designed to actually strengthen the main at the branch main connection where high stresses can be created by any movement of the branch main.

Calked or mechanical joint type sleeves and valves are available to fit your individual needs. Full range of main and branch main sizes.

Consult your Mueller Representative or write direct for full details and be sure to get your copy of the free folder on the new CL-12 Machine.

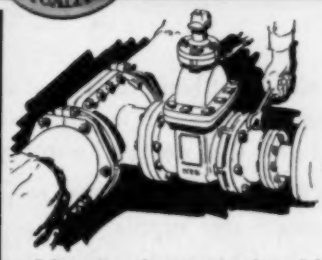
MUELLER CO.
DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles; In Canada: Mueller, Limited, Sarnia, Ontario



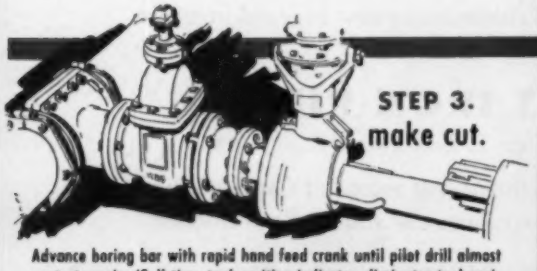
STEP 1. attach sleeve.

Clean main of rust and scale. Position and bolt tapping sleeve to main. Tighten or calk end lead end joints of sleeve.



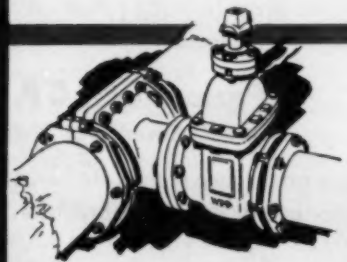
STEP 2. attach valve and CL-12 machine.

Bolt tapping valve to tapping sleeve. Bolt CL-12 Drilling Machine to tapping valve. Open valve all the way.



STEP 3. make cut.

Advance boring bar with rapid hand feed crank until pilot drill almost contacts main. (Full-time tool position indicator eliminates tool position guesswork.) Turn "auto feed set" knob until exact depth of cut required appears on feed travel indicator. Engage automatic feed and make cut. ("CL-12" may be operated by hand or power.) When cut is completed, feed will automatically disengage. Retract boring bar, close valve and remove machine.



STEP 4. make connection.

Slip branch main into valve and tighten or calk and lead joint. Open tapping valve to activate branch main.

Lower
Municipal Bond
Costs give

GREEN LIGHT

to needed
Water Works
Expansion
Programs

Municipal bond costs have declined substantially since the peak of September 1957. This is why officials of so many communities are going ahead now with deferred water system construction programs.

Officials in these cities recognize that delays in developing an adequate water supply can be costly. Water shortages can endanger public health, retard community growth and cause untold inconvenience to all citizens.

An overwhelming percentage of communities now engaged in water system improvement programs have specified:

Permanent CAST IRON PIPE

"America's Number 1 Tax Saver"

Their preference is soundly based on the proved record of Cast Iron Pipe for longevity, dependability, low maintenance cost and long run economy.

Our Company does not manufacture Cast Iron Pipe but supplies the nation's leading foundries with quality pig iron from which quality Cast Iron Pipe is made.

WOODWARD IRON COMPANY
Since 1882
WOODWARD, ALABAMA

it's too late when they start telling you!

AQUA NUCHAR

ACTIVATED CARBON FOR TASTE AND ODOR CONTROL

Here's the best way to avoid embarrassing taste and odor complaints. Stop them before they start . . . with daily threshold odor tests and AQUA NUCHAR!

AQUA NUCHAR activated carbon has high affinity for all substances that commonly taint water supplies. Properly applied in sufficient dosage, it efficiently adsorbs tastes and odors from algae, decaying vegetation, trade-wastes and other matter, soluble and insoluble. Concentrations required average as low as 2-5 ppm for extremely economical control.

We have produced activated carbon for industrial use for over 40 years, so when you use AQUA NUCHAR you benefit by our experienced technical assistance. And since stocks of AQUA NUCHAR are always readily available from 25 strategic warehouses, deliveries can usually be made within 12-24 hours.

We would be pleased to make a survey of your plant and to estimate your requirements.

industrial
CHEMICAL SALES
division west virginia pulp and paper company

230 Park Ave., New York 17 · Philadelphia National Bank Bldg., Philadelphia 7 · 35 E. Wacker Dr., Chicago 1 · 2775 S. Moreland Blvd., Cleveland 20

SPEEDS CAST-IRON PIPE INSTALLATION

Marcelletti & Son doubles daily production with fast-digging Cleveland

A fast-digging Cleveland 110 trencher enabled Emil Marcelletti & Son of Bedford, Ohio to make the most of the speedy pipe-laying made possible by new quick-connecting, bell-and-spigot type cast-iron pipe on this water line installation in North Ridgeville, Ohio.

Marcelletti's daily production, before putting the Cleveland on the job, had been limited because the backhoe method he was using didn't open trench fast enough to stay ahead of the swift moving pipe-laying operation. The 110 quickly doubled his daily production, on some days turning out nearly 3 times the trench footage he had been getting.

"The 110's high, reliable production and its ability to get by obstructions in narrow quarters really paid off for us on this job," says Jim Marcelletti, secretary-treasurer of the firm. "It's quick-shifting conveyor let it dig right by hundreds of trees, poles and hydrants along the trench line, obstructions that had previously slowed up our trenching operations."

accurate • fast • dependable • clean
—there's nothing like a Cleveland for trenching

Good Everywhere

The CLEVELAND TRENCHER Co.

20100 St. Clair Avenue • Cleveland 17, Ohio

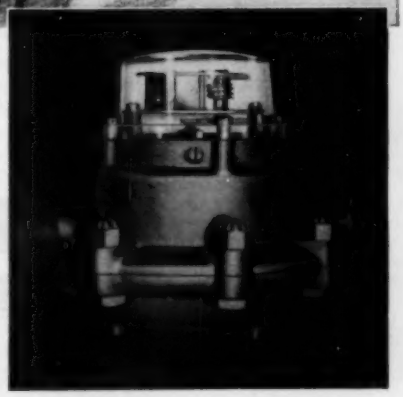
WATER DEPARTMENT, CHIEF ENGINEER

PLANNER OF OPERATIONS, JUDGE OF QUALITY

He says, "I recommend American Meters because of their advanced engineering, their simplicity and complete frost protection."

Men who have an engineering background appreciate the advanced design features of American Meters. They know that such features as the simplicity, the ruggedness, the thicker measuring disc, the transparent hard tenite plastic register cover, the "O" ring stuffing and packing, the ease of disassembly and assembly are the result of sound engineering knowledge and years of meter experience.

"Yes . . .", as Chief Engineer of the Water Department, "I recommend American Meters every time."



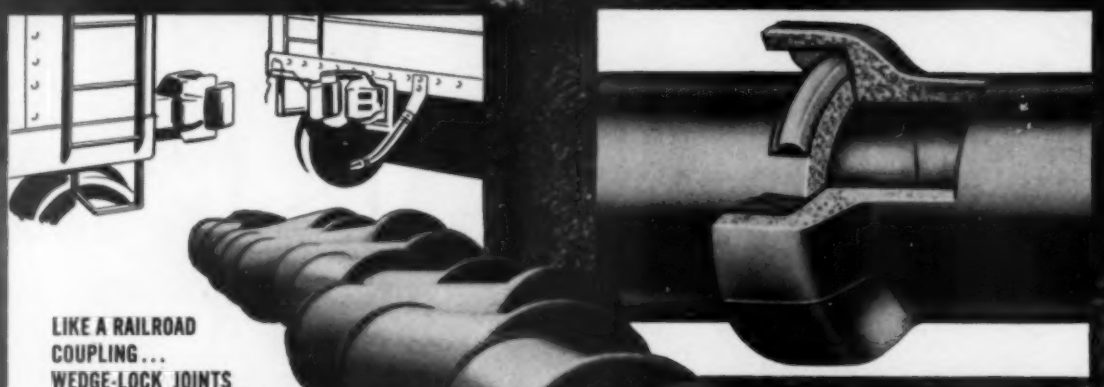
Use American Meters with sealed plastic register box for pit installation.

BUFFALO METER CO.

2909 Main Street • Buffalo 14, New York

NEW **Wedge-Lock*** JOINTS

Greatest Contribution to Sanitary Engineering since Vitrified Clay Pipe



LIKE A RAILROAD COUPLING... WEDGE-LOCK JOINTS WEDGE IN! LOCK TIGHT! IN ONE SIMPLE, EASY OPERATION

When you want to set high performance standards . . . control infiltration to strict specifications and reducing pumping costs . . . handle root problems . . . insure completion of the job exactly as originally designed . . . maintain lower cost-in-place due to faster, easier installation . . . you'll call for the *best* factory-made joint. Bonded-on Wedge-Lock Joints go in as fast as the trench is dug . . . "snap" tight instantly, in continuous compression . . . last as long as the world's longest lasting pipe.

Always specify *Vitrified Clay Pipe*, with *Wedge-Lock Factory-Made Joints*. Write to listed manufacturers for literature or an actual Wedge-Lock demonstration.

*Patented . . . T.M. Reg. U.S. Pat. Off.

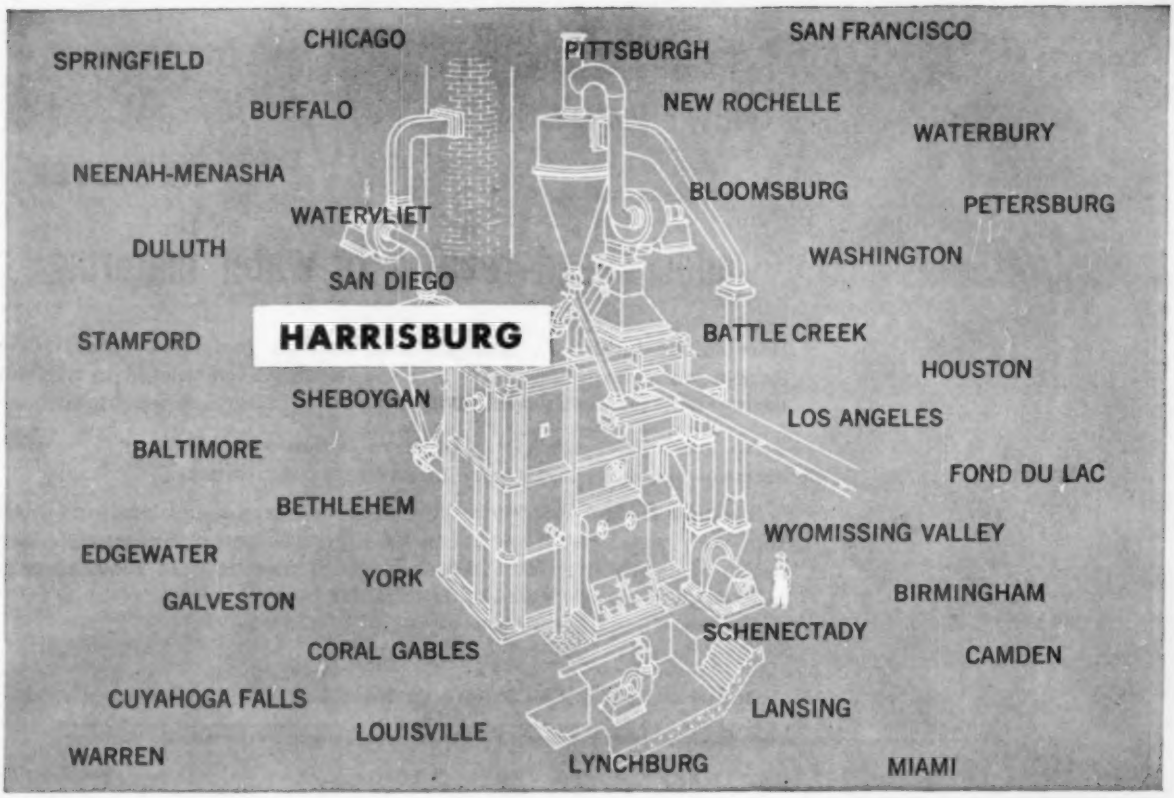
Wedge-Lock CLAY PIPE

THE FACTORY-JOINTED CLAY PIPE AVAILABLE NATIONALLY FROM LOCAL MANUFACTURERS

Order Wedge-Lock from any of these Vitrified Clay Pipe Manufacturers:

Cannelton Sewer Pipe Company, Cannelton, Ind.
Clay City Pipe Company, Uhrichsville, Ohio
The Evans Pipe Company, Uhrichsville, O.
Gladding, McBean & Company, Los Angeles 54, Calif. (Sold under trade name, "SPEED-SEAL")
The Logan Clay Products Company, Logan, Ohio
Oconee Clay Products Company, Milledgeville, Ga.
Pacific Clay Products, Los Angeles 54, Calif.
Pine Hall Brick & Pipe Company, Winston-Salem, N.C.
Pomona Terra-Cotta Company, Greensboro, N.C.
The Robinson Clay Product Company, Akron 9, Ohio
Graff-Kittanning Clay Products, Worthington, Pa.
Superior Clay Corporation, Uhrichsville, Ohio
The Stillwater Clay Products Company, Cleveland 16, Ohio

WLC-256-59



Harrisburg, Pa., joins the list of communities that use the C-E Raymond System for sewage sludge disposal

The new $7.4-million primary sewage treatment project at Harrisburg, designed by Gannett Fleming Corddry and Carpenter, Inc., and being financed and constructed by The Harrisburg Sewerage Authority, will serve an equivalent population of 175,000. It will have an average influent capacity of 27 mgd, and a peak capacity of 60 mgd.

The C-E Raymond Flash Drying and Incineration System here will reduce filter cake to a uniform product, having a total moisture content of only 10 per cent. Included in this system will be C-E's high temperature Deodorizing Preheater to remove annoying odors, and a centrifugal collector to eliminate fly ash. The dried product will be bagged for use as soil conditioner and sold locally. In addition, it can be used on the city's lawns, parks and golf courses. Surplus sludge can be *completely* burned in the C-E Raymond System incinerator, resulting in a clinker-free sterile ash.

It is for good reason that communities throughout the country are choosing C-E Raymond—the only system that permits flash drying and incinerating, separately or together, in any proportion. Contact your nearest C-E office to learn how this system can aid your community. We will be happy to discuss your needs with you or your consultants. No obligation, of course.

C-E

COMBUSTION ENGINEERING

C-170

RAYMOND DIVISION

1315 North Branch Street, Chicago 22, Illinois

Eastern Office: 200 Madison Avenue, New York 16, N. Y.

Western Office: 510 West Sixth Street, Los Angeles 14, Calif.

For further details on the C-E Raymond System—and data on more than 40 installations—mail this coupon to Combustion Engineering, Raymond Division, 200 Madison Avenue, New York 16, N.Y.

Name_____

Title_____

Address_____

City_____ Zone____ State_____

New! BADGER Read-o-Matic* REGISTER

adds speed-reading to water metering

Here is the industry's first practical outdoor register — the Badger Read-o-Matic. Now meter reading routes can be completed in half the time — with no more wasted calls. Plus other important benefits such as:

• ***No more "lockouts"*** • ***No more in-house accidents*** • ***No more access problems*** • ***No more inconvenienced customers***

The new Badger Read-o-Matic means a modern meter reading system that your water department can have now — and opens a whole new realm of possibilities for the future. You'll want to read about them in our free new Badger Read-o-Matic folder.

*Pat. applied for in U. S. A. and foreign countries

Badger Meter Mfg. Co. • 4545 W. Brown Deer Rd. • Milwaukee 18, Wis.

New Bulletins

CONTINUED FROM PAGE 43A

fields as the physical properties, chemical resistance, and typical equipment applications of phenolic, furane, polyvinyl chloride, polyester glass and tetrafluorothylene plastics are covered concisely and thoroughly with tables, pictures, diagrams and descriptions.

With this manual it is possible for the engineer to select and specify the correct corrosion resistant plastic equipment to meet any situation. This bulletin is based on the work and findings of Haveg's 32 field engineers over a period of the last 25 years.

Expansion Joint Catalog

931

Badger Mfg. Co., Cambridge, Mass., announces the availability of a new 80-page catalog covering Badger S-R Expansion Joints.

The publication includes complete information for rating expansion joints subjected to axial or laterial movement, angular rotation or combinations of these movements, together with formulae and tables for calculating the forces and/or bending movements developed in the connected piping or equipment.

Also included are tables of dimensions and weights for expansion joints from 3" to 72" in diameter, as well as other engineering data required to select, order and install Badger S-R Expansion Joints.

Automatic Valve Catalog

932

Cash-Acme, Decatur, Ill., has available a twelve color-page condensed catalog containing information on 212 popular valves. Of these, 19 are entirely new and have never been catalogued before. Convenient specification tables make it an ideal source for quick valve selection. Tables included: Valve Type, Pipe Size, Rating, and Shipping Weights. All tables are keyed to Cash-Acme's current price sheet, enabling prospective customers to find, price and order what they need, with a minimum of searching and cross-reference.

Slide Presentation on Water and Pumping

933

Layne & Bowler Pump Co., Los Angeles, Calif., has available a new slide presentation, entitled "Your Untapped Treasure," a graphic story of water resources and pumping techniques. This story is available for presentation to companies, business groups, and other agricultural, municipal and industrial organizations, and will be shown by a Layne & Bowler representative to interested groups.

This graphic slide presentation traces water from its sources to the well sites. It describes various water-bearing formations, methods of well-drilling, and pumping techniques. Descriptions of deepwell pumps and their operation is also included in this story. This is a worth while presentation and should be of extreme interest to all groups who are using or working with one of our greatest natural resources —water.

Diversified Product Booklet

934

Fischer & Porter Co., Hatboro, Pa., has just published a new full-color, 24 pp. Facilities Booklet that describes the diversified products of the company. Included are descriptions of flowmeters, process instrumentation, data reduction and automation equipment, chlorination equipment, and glass products.

Variable Speed Control

935

U. S. Electrical Motors, Inc., Los Angeles, Calif., has just released a completely revised, full-color brochure on the operation and application of Varitrol variable speed drive and pneumatic control systems. A special feature of the new brochure is the announcement of a U. S. Innovation —pre-engineered Varitrol instrumentation packages.

The illustrated four-color brochure shows how precise speeds of any selection may be set up and maintained automatically through the Varitrol pneumatic system and U. S. Varidrive variable speed units. With the Varitrol and Varidrive combination, any process requiring automatic speed can be controlled or changed automatically in response to a signal, without human attention, for precision control operations.

Low Cost, Precise Metering of Liquids and Gases

936

Builders Providence, Inc., div. of B-I-F Industries, Inc., Providence, R. I., has just published a bulletin on two especially accurate and economical meters, the Propeloflo for liquids and the Shuntflo for air, steam or gases. The six-page bulletin provides photographs, line drawings, cutaway views, and technical data tables to supplement the explanatory text.

Continuous Loss-in-Weight Feeding Systems

937

Omega Machine Co., Div. of B-I-F Industries, Inc., Providence, R. I., has published an 8-page, 3-color bulletin on simplex or duplex gravimetric feeders for liquids or solids. The bulletin provides explanatory text, dimensional drawings and tables, photographs, schematic drawings and performance charts.

Receiver Recorder and Controller

938

Bailey Meter Co., Cleveland, Ohio, has just released a sixteen-page Product Specification containing details of newly developed plug-in components for the Bailey Recorder. In all, twelve types of receivers, controllers, retransmitters, and direct measuring devices from which the recorder may be custom-built are described. Also illustrated is sealed, automatic, one year inking system and many exclusive features.

Solving Drainage Problems

939

Bethlehem Steel Co., Bethlehem, Pa., has just published a booklet on solving drainage problems.

Manufacturers of corrugated steel riveted culvert pipe, as well as designers, engineers and others who must plan and execute installations where drainage and loading problems are encountered, will be interested in and find useful this second edition. This 76-page illustrated brochure contains, in addition to a wealth of de-

CONTINUED ON PAGE 106A

Here's the big news behind the industry's first practical outdoor register

The Badger Read-o-Matic is powered entirely by the meter to which it is attached . . . works on an exclusive "pulse" principle. As water flows through the meter, the generator sends a pulse by wire to the Badger Read-o-Matic register outside for accurate recording.

Like our Badger meters, the Badger Read-o-Matic is precision-engineered — thoroughly tested by our trained water meter experts in the laboratory and in the field. Badger Meter products are the result of over 50 years of *specialized* water meter experience — products that excel around the world in accuracy, durability, dependability and low maintenance cost.

Send for free, colorful brochure that tells you all about the revolutionary Badger Read-o-Matic. For an actual demonstration, see your Badger representative or write us direct.

Badger Water Meters

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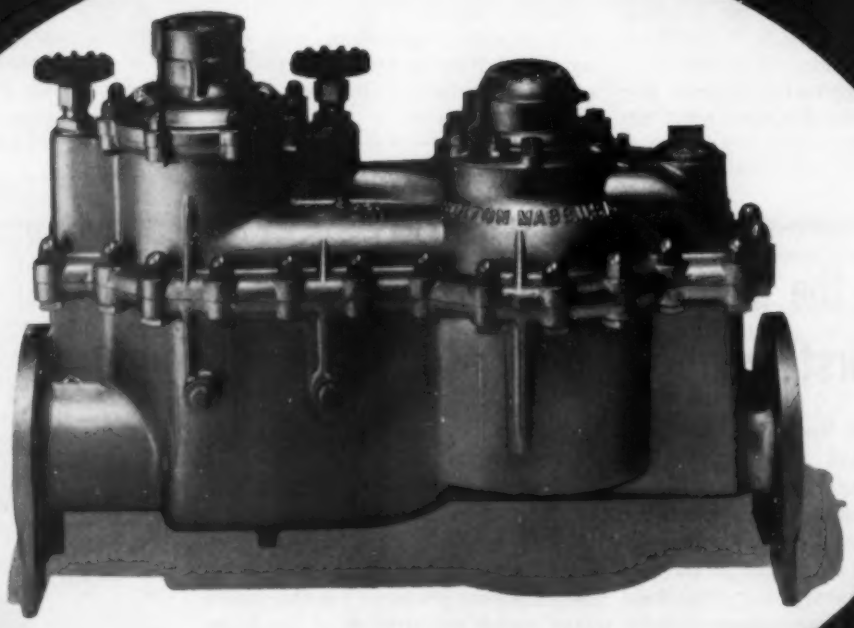

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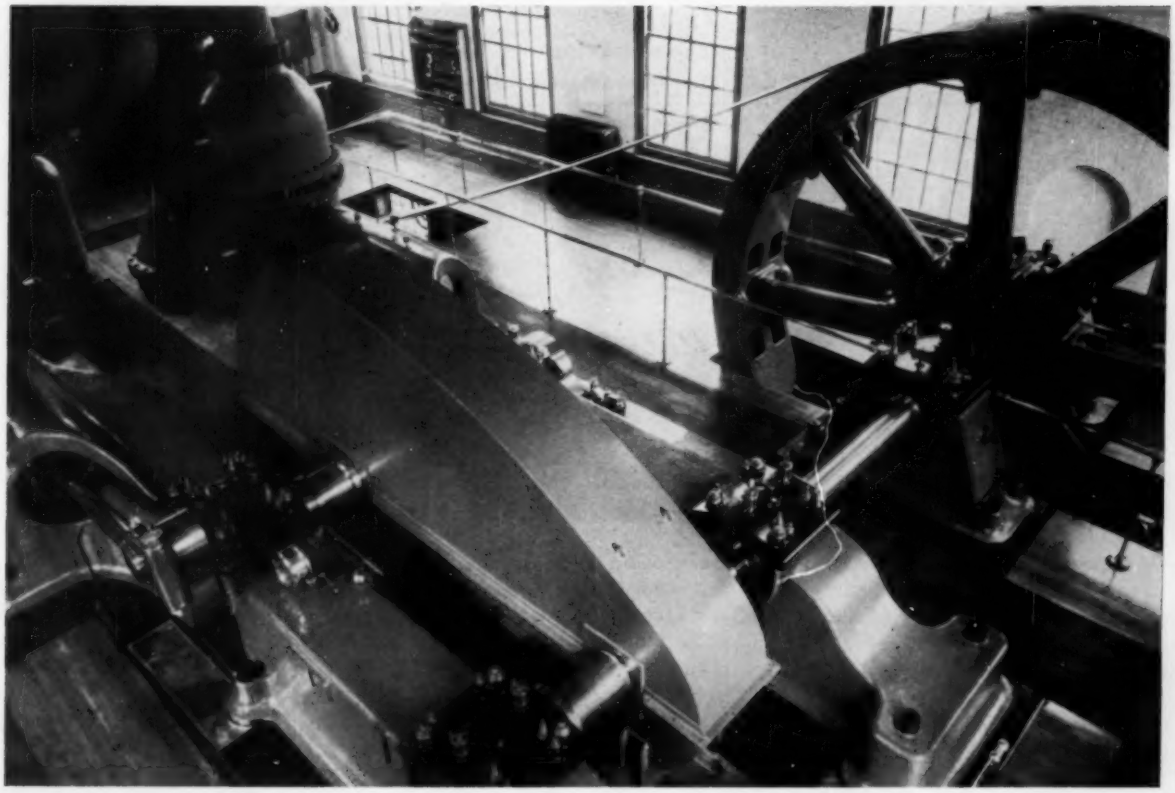
TRIDENT WATER METERS

Vol. 105, No. 9 · September, 1958

WATER & SEWAGE WORKS

A Scranton Gillette Publication



INSTALLED in 1900, this pump, driven by water power, pumps nearly 60 per cent of the water for Nashua, N. H., where more than a century of satisfactory service is the record of the privately owned . . .

Pennichuck Water Works

by DON C. CALDERWOOD, President

EDITOR'S NOTE: In this month of September, when the New England Water Works holds its annual meeting, it is fitting and proper to salute that Association by presenting a story of an outstanding water supply in New England. For this year, we have chosen the Pennichuck Water Works as typical of water supplies in that area of the country where the importance of service to customers has been recognized for many decades.

In this article, the author, a Past President of NEWWA, reviews the interesting history of this privately owned company, its growth and development, and its present facilities and operations.

■ IN 1852, when the population was about 6,000, the men of Nashua and Nashville, as that part of the city north of the Nashua River was called, associated themselves together and formed a company, the purpose of

NASHUA, N. H. is a hustling New England city with a population of 40,000, it borders on the State of Massachusetts and possesses the characteristics of both states. It is called the "Gate City of New Hampshire"; this is no idle boast as its location in the southern part of the state makes it a natural place of entrance to the state. It lies on the west side of the Merrimack River and is bisected by the Nashua River which joins the Merrimack within the city limits. Since colonial times it has occupied a strategic location for transportation, commerce, and industry.

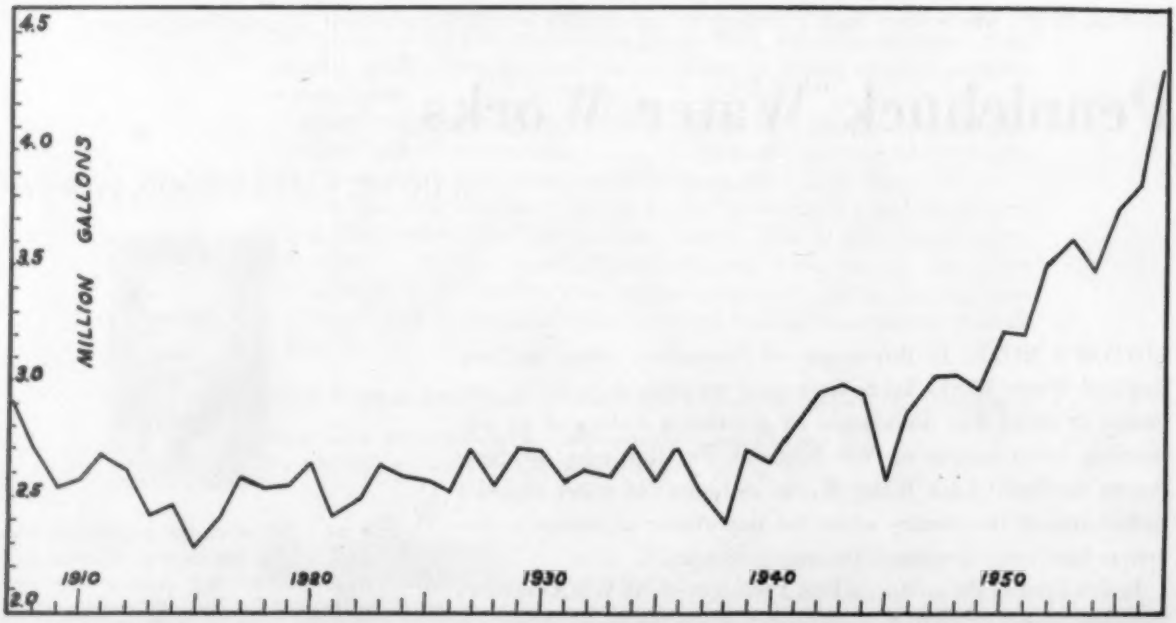
In the early colonial times it served as a trading post, but with the available water power, industry obtained an early start with the development of the cotton textile industry in the early 1800's. Until World War II textiles were the largest single employer of labor; unlike many communities it was not a one industry town as its industry was widely diversified. This diversification has greatly assisted in the stable steady growth of the city and figures recently released by the New Hampshire State Planning and Development Commission indicate that since 1950 it has been the fastest growing city in the state.

SIX impounded reservoirs on the Pennichuck River provide ample storage.

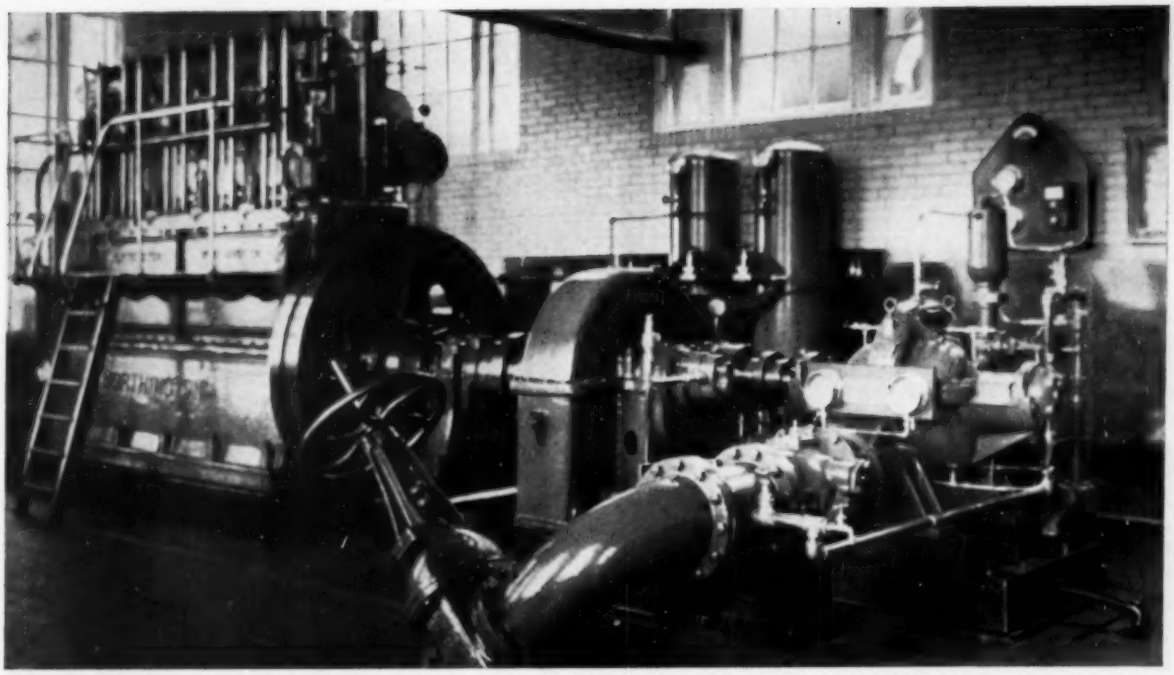
which was to secure for the two towns an adequate supply of water. This action was taken one year before Nashua became a city, and approximately twenty years before any other city in the entire Merrimack Valley, (although they had much larger populations) faced the problem of developing a municipal water supply. A charter for this water company was received from the State Legislature on June 19, 1852 and the first annual stockholders meeting was held in May, 1853.

Early History

Once the company was formed and the Directors elected, months of study and time consuming effort faced these individuals. A municipal water supply system was a new type of enterprise and consulting engineers, stand-



DAILY PUMPAGE record for past 50 years shows marked growth in past two decades.



CENTRIFUGAL pump operated by 250 hp diesel engine, located in easterly wing of Snow Station has capacity of 5.8 mgd.

ards, etc. as we know today were nonexistant. One committee was charged with the problem "to ascertain what encouragement would be offered by the citizens and corporations for the prosecution of the aqueduct enterprise"; another committee was instructed to acquire a drainage area from which water could be obtained. After much study and thought given to investigating the various water sheds in and about Nashua, the waters of Pennichuck Brook and its tributaries were selected as being of the best quality and of sufficient quantity to meet the requirements of a water supply system. This was in 1853, and the name of the Company was, at the same time, changed to Pennichuck Water Works, after the brook from which the water was to be taken. Also, quoting from the records, a committee was chosen "to make investigations as to the best material for packing (caulking) pipe" and a committee of three "was appointed to determine the form and length of the socket (bell) of the pipe." These quotations serve to show the magnitude of the problems faced by these pioneers.

The first water supplied was drawn from a pond formed in 1854 by building a dam across Pennichuck Brook, just west of the Concord Road. This dam, which was intended to raise the water about twenty feet, was built of gravel and was probably of light construction as it washed out with the high water of 1866. A stone dam, erected in its place, is still in use. As time went on other dams were built along the valley and an immense volume of water impounded.

The original pumping station was built in 1854. It was a wooden structure and housed a water turbine-driven pump, made at the Lowell Machine Shop. This company, afterwards known as the Saco-Lowell Shops was later to receive world wide fame as a builder of textile machinery.

In 1865, a very dry year, the quantity of water in the brook proved insufficient to provide both power for pumping and a supply for the city, so an engine and boiler were installed, as an auxiliary unit, to use when the water in the stream was low.

Previous to the installation of the engine and boiler a tread mill had been attached to the water pump to supplement the power from the brook. This tread mill was operated by a horse, which, tiring of the work, was inclined to shirk. Therefore, in order that there should be no interruption in the service, the engineer at the time, a Mr. French, rigged up what was known locally as "French's Spanker." This spanker consisted of a stick or board, so arranged, that at a certain number of revolutions of the pump the stick would descend upon the back of old Dobbin, urging him to greater effort.

Distribution System

At the time of the original water works construction in 1854, a small distribution reservoir of 600,000 gallons capacity was built on Winter Hill, where the present one is located. It was torn down in 1885 and one of stone, circular in form and holding 4,000,000 gallons, was built in its place. This reservoir was in constant use until 1941 when a steel reservoir of 2,800,000 gallons capacity was erected to give additional pressure on the distribution system. The old reservoir is now held substantially full of water for standby use.

The original estimate for the distribution system called for 600 feet of 14-in., 2,800 feet of 12-in., 2,000 feet of 10-in., 8,200 feet of 8-in., 4,500 feet of 6-in. and 1,400 feet of 4-in. cast iron pipe. In the 1850's Nashua was one of the leading iron and steel centers of the country and the order for the pipe was placed with a local foundry. A part of this pipe is still in use giving satisfactory service even by today's standards.

BOWERS DAM (left) of wood timber construction, built about 1890 impounds 260 mil gal (surface area 87.3 acres), Harris Pond in foreground is impounded by Harris Dam (right) which was built in 1895 and impounds 400 mil gal with a surface area of 83.3 acres.

This pipe was cast in horizontal moulds and had a nine foot laying length. The metal thickness corresponds with that of the present day Class "A" pipe which is recommended for 42 psi working pressure. For years the operating pressure on some of this original pipe has been 65-70 psi. The original plans for laying this pipe called for an 8-in. line from the pumping station, across country, to the reservoir—about 5700 feet—with 10-in. and 12-in. lines from the reservoir, across the Nashua River, into the business center of the city.

Twenty-five hydrants were put in with the initial installation of pipe. The first water rents were collected in October, 1855.

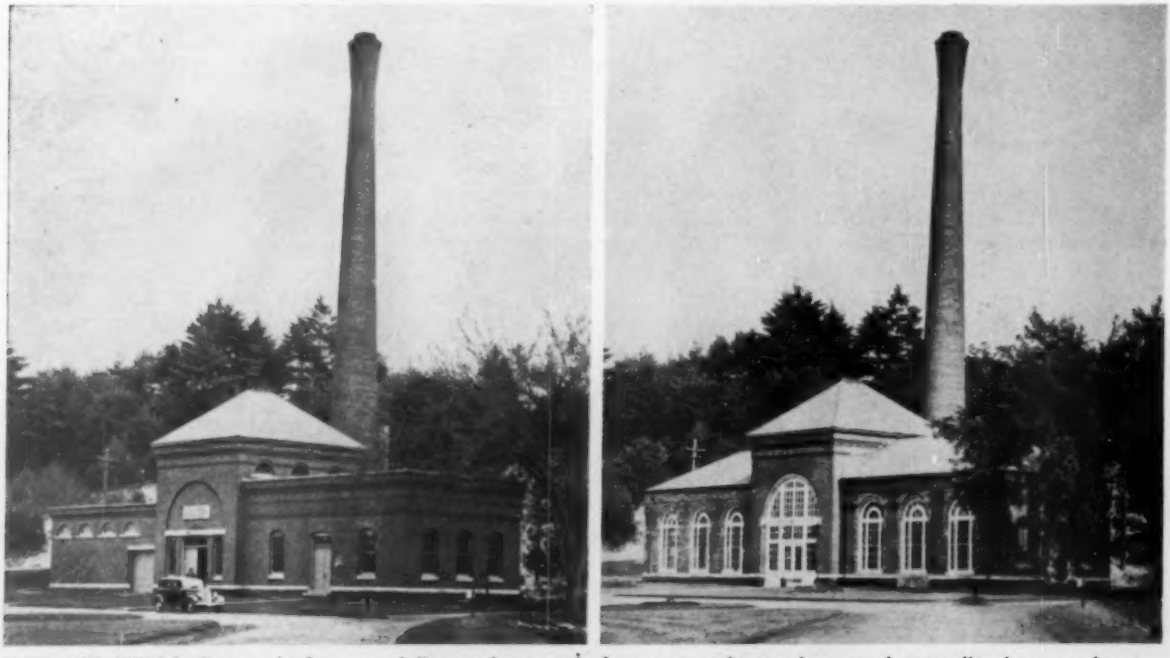
The problem of laying this pipe across the river aroused much interest. Living in Nashua at the time was a teacher of mathematics, who, when consulted, advanced the theory that, if an 11 inch "Boiler Iron Pipe 5/16-in. thick" was laid so as to be slightly arched in the center, it would, with the aid of a few lateral wind braces, remain suspended after the water, under pressure, was in the pipe. When the time came for the opening of the gate and the filling of the pipe, a large gathering of people was on hand to see if the theory was sound. The pipe, needless to say, found a resting place on the bottom of the river.

After this disastrous episode the Directors engaged a bridge builder to build a trestle across the river to support the pipe.

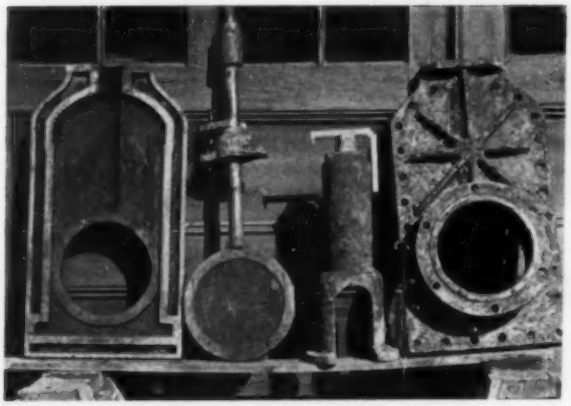
This is but a brief account of what was done by the founders of the Pennichuck Water Works, who faced not only a project largely new, but one whose financial returns were problematical. Since their time, many improvements have been made and much of the plant has been rebuilt but these small beginnings were the foundation stones for the present system and much credit is due the pioneers for their efforts.

Present Water Works

The Pennichuck Water Works controls practically the entire water privileges of Pennichuck Brook and its tributaries with a total water shed area of 25.36 square miles. It also has surface holdings of more than 2400



SNOW STATION before and after remodeling and removal of steam pumping engine, now houses diesel powered centrifugal pump and two electrically driven centrifugal pumps of 4.5 mgd capacity each.



OLD 10-INCH gate valve (left) disassembled to show construction; spindle had been broken some time previous to removal from the ground. Right, bell end of 10-inch cast iron pipe installed in 1854 and removed from service a century later; note bell depth of 5 inches compared with standard 4-inch depth of today.

acres, 287 of which are water. This marginal land was acquired from time to time for the purpose of protecting the supply from pollution.

In order to derive some revenue from the land which otherwise would be unproductive, the area has been largely seeded or planted to white pine. The growth of this pine was remarkable, but the hurricane of September, 1938 destroyed in a few hours that which took nature years to produce. After the hurricane nearly five million board feet of logs were salvaged and sold. Our forest areas still have many mature trees and most of the scars of the hurricane are now shielded from view by an excellent growth of young pine.

Most of the domestic and commercial water supply is obtained from springs and flowing wells. This water is collected in a storage basin, called the Supply Pond, having a capacity of 56 mil gal from which it is pumped either to the distribution reservoir or to the mains. The approximate daily yield from these springs and wells is 4 mil gal.

For many years these springs and flowing wells supplied all the water used in the city. However, the consumption has so increased since World War II that during the hot dry summer season the surface water stored in three ponds upstream from the Supply Pond is used to supplement the yield from the springs. These ponds impound 650 mil gal of excellent quality water.

To prevent surface water from the valley from mingling with that from the wells, it is diverted around the storage basin through a 72 inch penstock. This penstock provides a wasteway for the excess from the valley, and the water passing through it is utilized, as needed, to furnish power for a Dean & Main water-power pump.

To insure reliability of service, several kinds of power are used to drive the various pumping units, which are housed in three separate brick buildings. The pump used most is a 6 mgd horizontal duplex plunger type pump specially designed by Dean & Main. The power for this pump—as stated—is obtained from water passing through the 72 inch penstock under a 57 foot head, driving a 300 hp water wheel at a rate of 400 revolutions a minute. This wheel in turn drives a 16 foot fly wheel attached to a drive shaft turning at the rate of 100 revolutions a minute, and the power is then transmitted to the pump by a chain drive. During the past ten years this unit has pumped approximately 58 per cent of the water used. Obviously, this pumping unit is used at all times when the run-off in the valley is sufficient to provide the needed power.

In the easterly wing of the so-called Snow Station is housed a centrifugal pump diven by a 250-hp diesel engine. This unit, installed in 1934, has a capacity of 5.8 mgd. In the westerly wing of this same building are located two electrically driven centrifugal pumps, installed in 1949. These are identical units each having a capacity of 4.5 mgd when operating individually or 8.4 mgd when operated in parallel. These electrically driven pumps are located in the wing that formerly housed the steam pumping unit installed in 1893.

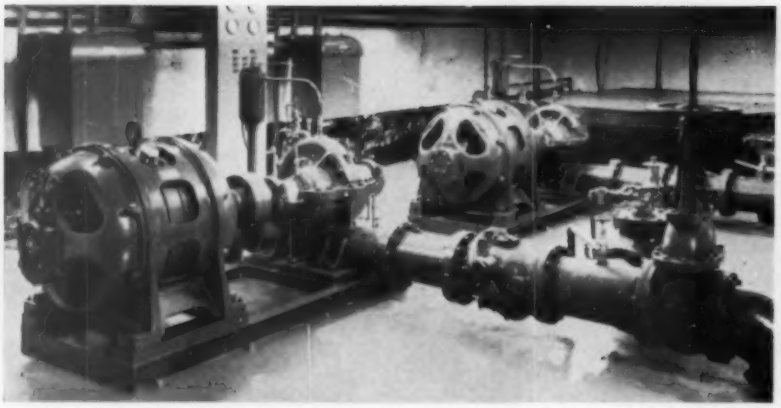
At the outbreak of World War II, before the electrically driven pumps were installed, two centrifugal pumps driven by gasoline engines were installed in the old Worthington Station. These were for emergency use only and have a combined capacity of 3.5 mgd.

The suction lines and piping is so arranged that any of the pumping units can be operated in parallel.

There are two trunk lines into and through the city, a 16 inch and 24 inch main. The system is elongated north and south, which makes it difficult, because of the river, brooks, and railroads, for ideal gridironing. The mains consist of 102 miles of cast iron pipe ranging in size from 4 to 24 inches and 9 miles of mains less than 4 inches in diameter. About 1930 the company established a minimum pipe size policy of 8-in. for cast iron distribution mains.

There are 7455 services in use. All commercial and industrial services are metered, but we still have 2250 domestic customers on the so-called flat or fixture rate. For several years meters have been placed on all new services or where there is a change of ownership of an unmetered property. This approach softens the financial impact of a crash metering program and in the end will accomplish the same result.

We are very much gratified that after the most recent survey the National Board of Fire Underwriters rated our water supply system as Class I.



ELECTRICALLY driven centrifugal pumps (4.5 mgd, each) located in west wing of Snow Station have a combined capacity in parallel of 8.4 mgd.

In common with most growing communities, the increase in the number of customers, the opening of new areas for development, and the new uses for water such as air-conditioning, garbage disposals, and different industrial processes have given us our troubles too.

Basically, we were very fortunate that through the years, the management and builders of the system were very far sighted and built in reserve or excess capacity. Because of the foresight we have not been subjected to all the problems and expense expeirenced by some communities. In order to keep ahead of the situation we are constantly making engineering studies in an attempt to determine both the immediate and long term needs of our system.

Many projects connected with a water supply system must be anticipated, planned, and construction started years ahead in order to prevent shortages and the imposition of restrictive measures. To date, it has never been necessary to restrict the use of water.

New Distribution Reservoir

As a result of these studies a steel distribution reservoir has been constructed at the southerly side of the city. This reservoir is 160 ft in diameter and has a capacity of 5 mil gal. The remarkable thing about this reservoir is the short time it took to have it become a part of our system.

At the Directors meeting on February 3, 1958 it was voted to proceed with the erection of the reservoir provided that the required permission could be obtained from the New Hampshire Public Utilities Commission and the financing arranged. It took the rest of the month to arrange these details and contracts were signed for 16-in. and 24-in. pipe, fittings, foundations, and steelwork about March 1st.

Deep snow still covered the ground and actual construction was delayed until the last week in March. More than 1500 cubic yards of ledge had to be removed in the preparation of the foundations, and ledge was encountered for practically the entire distance in the construction of the 16-in. and 24-in. connecting pipe lines. All the steelwork and pipe lines were completed and the reservoir filled with water for testing on June 12.

Three and one-half months from the placing of the first order the project was completed except for the painting. The total completed cost will be nearly one quarter million dollars. How times and conditions change—one year ago the best delivery that could be obtained on the steel alone would have been 18 to 24 months. An example of the far sightedness of the management—the site for this reservoir was purchased 50 years ago.

To build reservoirs, miles of pipe lines, install pumping units, services, meter, etc. takes money—lots of it. Some of this money came from retained earnings and depreciation charges, but most of it was obtained from long term borrowing from insurance companies. In the last few years we have borrowed nearly a million dollars to pay this required expansion program. Our next major financing will have to be in the form of equity capital.

Water Rates

In times of inflation, increased operating costs and large additions to plant go hand in hand with rate problems. For many years any change in the water rates was accomplished by a percentage increase across the board. Through the years this resulted in inequities. Therefore last year a complete accounting analysis and cost of service study was made after which an entirely new set of rates was developed based on these studies.

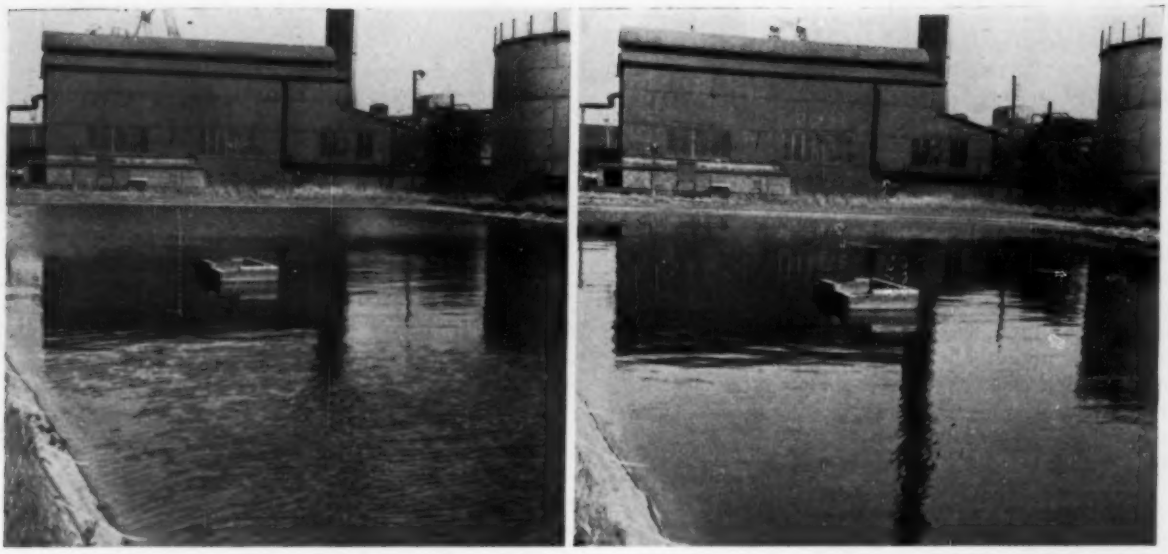
This new rate schedule, by lowering the allowable use under the minimum rate, resulted, percentagewise, in a rather substantial increase for the smaller users (1500 to 4500 cu ft); but for those using between 7,000 and 250,000 cu ft per quarter there was a decrease. There was also an increase for those using over 250,000 cu ft a quarter. After many conferences and the filing of reams of supporting data the New Hampshire Public Utilties Commission finally allowed these new rates to go into effect. In common with most rate changes it resulted in some complaints, but by having adequate publicity we feel these complaints were held to a minimum.

Taxes are as great a problem to the water company as they are to the ordinary individual. As far as local property taxes are concerned we are the third largest taxpayer in the city. Our combined local, state, and federal tax bill takes 37 cents from every revenue dollar.

The Pennichuck Water Works is the largest and one of the few privately owned water companies left in the state. Periodically some individual or minority group brings up the question of public ownership. So far, the more stable minds have prevailed and to date these proposals have not been backed by a number substantial enough to bring this change about. The management has always operated on the policy of "what is the best for Nashua?" and this procedure through the years has built up a deep seated good will which is hard to break down.

The Company is owned by approximately 300 stockholders most of whom are Nashua residents.

There are 25 employees and except for a few of the larger construction projects, the company has done all its own construction and maintenance work.



WATER SURFACE, unruffled by wind, shows extent of spreading of chemical film in experimental tank, in Cheshire, England, where studies are being made on . . .

Cetyl Alcohol *for Evaporation Control*

by WILLIAM A. HEATH
Surrey, England

■ WATER LOSSES thru evaporation—about 13 cubic miles being lifted from the earth's surface every 24 hours—are being reduced in many parts of the world following extensive work by the Commonwealth Scientific and Industrial Research Organisation (C. S. I. R. O.) in Melbourne, Australia.

Co-operating with experimenters in other parts of the British Commonwealth, notably Kenya (East Africa), and with a British company, Price's Limited in Bromborough, the C. S. I. R. O. has developed two methods of filming reservoirs and storage tanks with a skin of cetyl alcohol less than one millionth of a millimeter thick. This skin of cetyl alcohol (hexadecanol), priduct of the sperm-whale's oil commonly used in manufacture of cosmetics and pharmaceutical products, can be penetrated by oxygen and rain; it has no effect on the water it protects against wind and sun, and is harmless to acquatic life.

Application from Rafts

Trials carried out in Kenya by F. Grundy, of the East African Meteorological Department, Nairobi, were described in Water & Sewage Works of August 1956.

These African trials were based on the raft method of misting reservoirs. Rafts, each containing one pound of cetyl alcohol in small pellets, were anchored one to every acre of water surface area. Film was formed by action of the water on the pellets which were enclosed in fine copper-mesh baskets in the raft framework.

Rafting has also been tried in Australia, where it has proved of particular value to the sheep and cattle farmer who usually depends on a station tank, dug in the catchment area, for his water supplies. Until now station tanks had to be excavated to a depth of 14 feet to allow for the quantities of water lost because of evaporation; and the deeper the tank, the greater the cost. Now that evaporation losses can be cut, the tanks can be dug to a less costly depth, the number of tanks on a station can be economically increased, and therefore the size of the herd supported increased.

Field trials in Australia have shown that savings of up to 70 per cent can be achieved at a cost of about $27 per year per acre of water surface. This figure includes the cost of the raft — $75 — which is estimated to have a life of five years, and a year's supply of cetyl alcohol, i.e., 8 pounds per acre per year at $1.40 per pound. Labor charges are additional.

Subsurface Application

The second method which has been successfully tried out in Australia aims at conserving water supplies in larger reservoirs. It takes advantage of two of the factors which cause evaporation, sun and wind. Flakes of cetyl alcohol are dissolved in a solvent and released in a series of small drops below the water's surface. The drops rise to the surface where the solvent evaporates in the heat of the sun, leaving the film. This is blown across the reservoir until the whole surface is covered. Since effective filming depends on the wind spreading the cetyl alcohol skin, the dispensers containing the solution are fitted with wind-operated valves, ensuring that the solution is only released down-wind, thus preventing wastage.

Drips of solution are released at depths between one inch and 12 inches below the water surface. Dispensers are both shore-based and floating on rafts. Treatment is at the rate of 8 to 9 pounds of cetyl alcohol per square mile per day.

This method has been applied successfully at Broken Hill (Australia) using flake cetyl alcohol dissolved in a hydrocarbon solvent with a boiling point of 140°C. A small quantity of methylated spirit was added to increase solubility of the cetyl alcohol, the final solution being made up of 10 per cent cetyl alcohol, eighty per cent solvent (Shell X95) and 10 per cent methylated spirits.

Losses from this reservoir, the main water supply for Broken Hill, are normally four times consumption and in the dry season evaporation wastage is 80 to 100 million gallons a week, against consumption of 20 to 25 million gallons. The solvent method of application of cetyl alcohol has reduced wastage by 37 per cent, using four dispensers per mile of reservoir perimeter.

Cetyl Alcohol Pellet Manufacture

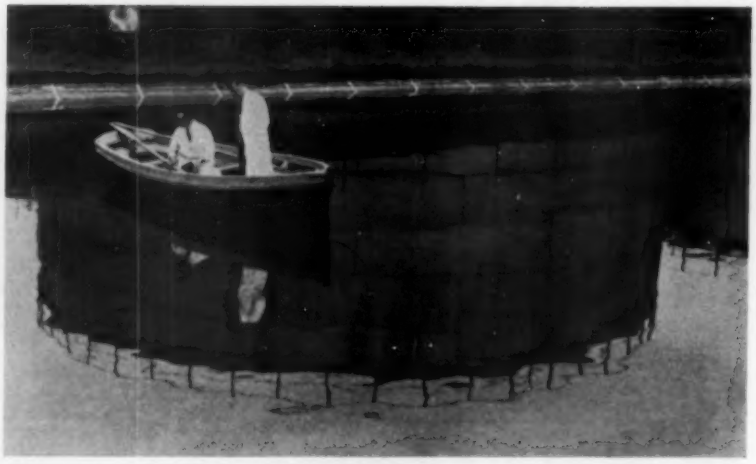
Biggest problem in the fight to cut evaporation losses was the production of suitable forms of cetyl alcohol; solid blocks and small flakes were used in the rafting trials in Africa and Australia. The flakes gave a satisfactory film, but were so fragile that they disintegrated in the rafts and were wasted.

Production of beads in Australia resulted in only a small percentage of each batch coming within the size range required for effective operation.

That was the situation when the C. S. I. R. O. approached the British firm Price's Limited with a request to produce beads of a standard size between 2 and 4mm in diameter.

The firm devised a method of meeting this requirement; liquid cetyl alcohol was forced thru an aperture so that it formed a liquid jet. This was subjected to sonic vibration which separated it into liquid particles which solidify as they travel through the air and are collected as uniform sized beads.

As the effectiveness of the cetyl alcohol film depends on the material used, the C. S. I. R. O. has decided to protect users by awarding a certification mark to manufacturers who succeed in meeting the stringent specifications. The mark is known as SIRO-SEAL and the first company in the world to be awarded it is Price's Limited.



ALMOST PERFECT REFLECTION, blurred only by wind, shows water surface is filmed. Technicians are experimenting with cetyl alcohol at factory of Price's (Bromborough) Limited, Cheshire, Eng.

Formula of the Cetyl alcohol beads awarded the certification is:

Cetyl alcohol—not less than 80%
Octadecanol (Stearyl alcohol)—not more than 10%
Tetradecanol and dodecanol—not more than 5% together
Alcohols of chain length less than 10—not more than 0.5%
Unsaturated alcohols—not more than 4%
Iodine value—less than 3
Acid value—less than 0.3
Saponification value—less than 0.5
Hydroxyl value—225 to 230
Melting point—47-50°C.

The use of cetyl alcohol is a proven technique for the reduction of evaporative losses from open bodies of water. The effectiveness of this treatment, however, depends on the application and maintenance of the film over the entire body of water. The engineering problems connected with meeting this requirement have for the most part been solved now.

DEMARKATION LINE between relatively smooth surface and marked ripples shows area covered by film.

SAN GABRIEL'S 4,000 PERCENT INCREASE in service connections cause the installation of a . . .

Telemetering and Remote Control System to maintain and improve service.

by KENNETH L. WILKERSON and M. E. MOSELY, Gen. Superintendent and Vice President, respectively, of the San Gabriel Valley Water Company, El Monte, California.

RESUMÉ: Experiencing rapid growth problems, common to so many water companies over the past 20 years, the San Gabriel Water Co. installed telemetering and remote control equipment to help counteract these problems and provide a more efficient method of maintaining and improving service. Complete supervision and control of the well supply, storage and distribution systems is now possible from one central control station.

■ THE HISTORY of Southern California's astounding growth over the past two decades has had to be paralleled by its water supply agencies. City Water Departments, Water Districts and privately owned Public Utility Water Companies have all been faced with the same problems: More water, more capital, higher operating costs, declining returns on investment and the need to devise more efficient methods to maintain and improve service.

Certain local areas have experienced growth far beyond the average and San Gabriel Valley Water Company has enjoyed this situation and met the challenge of an expansion from 1,146 customers in 1937 to 45,046 service connections of all types at December 31, 1957. This 4,000 per cent growth may be surpassed by some but not by many.

The Company, a privately owned public utility under the jurisdiction of the California Public Utilities Commission operates in three separate divisions. The Fontana Division serves the City of Fontana and surrounding county areas comprising some 42 square miles with 13,456 connections. The Kaiser Steel Mills and firms engaged in forging, steel fabricating, oxygen and coal tar production are the principal industrial base of this community. The Whittier Division is considerably smaller in area consisting of the communities and cities and parts of the communities of Southwest Whittier, Los Nietos, Pico, Rivera and Santa Fe Springs. This area is primarily residential but industrial development is rapidly expanding. The new assembly plant of Lincoln-Mercury Division of Ford Motor Company and Bell Brand Foods are the Water Company's two largest consumers in the Division which serves 11,336 connections.

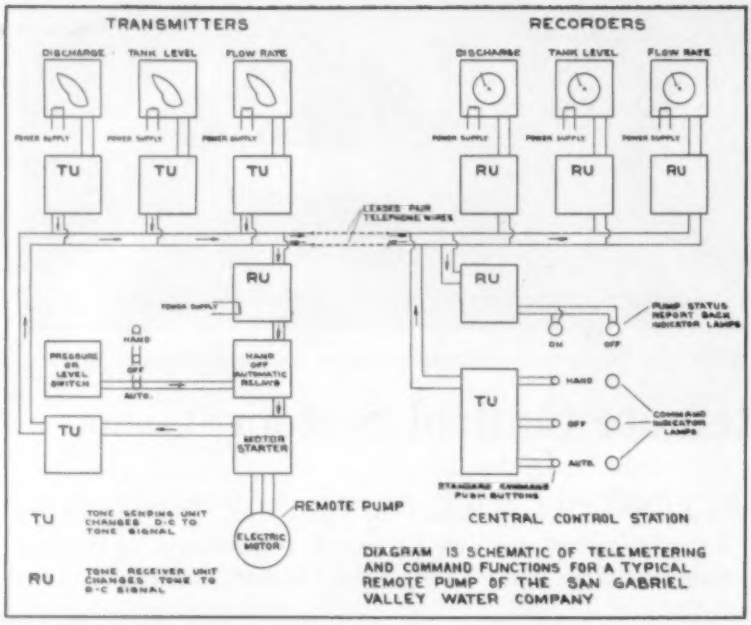
The El Monte Division consists of the communities and cities and parts of the communities and cities of El Monte, Bassett, City of Industry, South San Gabriel, Baldwin Park, Norwood Village, La Puente and Rosemead. This area too, is principally residential but growing rapidly in industry. A total of 20,257 service connections make this the largest division of the Company.

Supply and Distribution

It was the El Monte Division which the Company selected for first application of telemetering and remote control. The possibilities included control of 25 turbines and 28 booster pumps. All of the supply is obtained from wells ranging in depth from 140 to 700 feet and in developed capacity from 800 to 5,500 g.p.m. 21% of the well pump capacity is in high head turbine pumps capable of delivering water directly to the system at a rate of 10.7 m.g.d. The balance of the wells, 12 in number located at 6 plants, deliver water to ground level reservoirs and tanks ranging in size from 92,000 to 600,000 gallons. These well pumps with a total capacity of 39.5 m.g.d. have in the past all been automatically operated by means of tank level switches.

25 of the high head booster pumps located at the 6 main plants can deliver 44.4 m.g.d. to the system. They have been operated automatically by sequenced pressure switches meeting the demands of virtually a closed system. Three boosters take water from the main system to an intermediate and a high level reservoir for one remote elevated district.

Peak moment demand occurred on July 4, 1957 when delivery reached 25,875 g.p.m. Peak day production was on the same day with 20.8 million gallons delivered.



UPPER PART of diagram shows level and pressure reporting and recording elements. Lower part shows elements governing and reporting functions of a single pump.

After considering a system of pumps spread over 10 miles East and West and 5 miles North and South, it was readily apparent that the most pump control for the least money in equipment and leased wire rental would favor control for the 6 main plants.

Control of the three remote boosters and the two reservoirs which they feed was also most essential. Study of available telemetering equipment and the desired functions began in 1954 and was concluded in December 1956 when an order was placed for control equipment for 3 of the main plants 1, 2 and 8, the remote boosters at G3 and G5 and the intermediate and the high level reservoirs. Central control equipment for these stations was ordered to be placed at the Company's main office near the center of the division. Delivery of the equipment began in May 1957 and by December 31, 1957 the 20 pumps and 5 reservoirs were under central control.

Supervisory and Control Equipment

The supervisory and control equipment located at the Central Control Station is contained in floor standing cabinets finished in hammertone gray with black telemetering receiver instruments. For identification purposes each control panel has an assigned system number in reference to remote station or stations controlled and telephone circuit number.

For statistical purposes, the production from each pumping station is recorded. A flow rate transmitter at the pumping station supplies the required information which is telemetered by tone equipment to the central office where chart recording instruments continuously record rate of flow and total production. Tank level and booster discharge pressures are also continuously reported to the central office by tone equipment where recording instruments continuously record tank level and discharge pressure on 24 hour charts. The control panel contains three sets of push-buttons and lights for each pump governing hand-off-automatic operation.

At each of the remote plants there is local control of each motor by means of a hand-off-automatic switch associated with the pump starter. Normal position for these switches is the auto setting.

A pressure, tank level or reservoir level switch for each pump starts the pump at a predetermined pressure or level so long as the H.O.A. (Hand-Off-Automatic) switch is in automatic position. If manual operation from the control center is desired an override of the automatic position of the remote switches, is provided, allowing the control operator to place any pump either in hand or off operation and then reset to automatic position. In addition, a permanent memory status lamp lights, indicating the last command given for each pump, also a report back lamp for each pump as to its operation status, is provided.

Two types of supervisory and telemetering equipment are used, one being audio tone system, the other a pulse width selector. Both systems are designed to operate over voice grade telephone lines, with a maximum attenuation no greater than 12 decibels at 1,000 cycles per second. The supervisory and telemetering signals are within the frequency range of 400 to 2,700 cycles per second, with a spacing of 100 cycles per second between tone channels for each function.

Audio Tone System

The audio tone system employs A-C voltage signals in the audio or hearing range. The audio tone transmitter consists of a tone generator oscillator, which is fixed, tuned and sealed to generate a particular frequency. Frequency multiplexing is the general term applied to the transmission of many audio frequencies by a single medium, whether it be a telephone line, radio broadcast, or microwave. Transmission of commands and supervision is achieved in the following manner. Pressing a command push-button (H-O-A) causes a relay to energize and key a tone generator. The tone generator oscillates at a stable fixed audio frequency. The output or signal is transmitted over the telephone line to a matching receiver band-pass filter. If the signal received is the correct frequency to pass through the fixed tuned band-pass filter, it is amplified and rectified, and results in the operation of a single pole, double throw relay. An integral part of the receiver, the relay is used to actuate the hand, off or automatic operation.

Supervisory report back information is carried by one tone channel per pump. The supervisory information indicates whether the pump is on or off. Tone on would mean pump on, and tone off would mean pump off. Contacts located on the electrical starter for the pumps are the primary source of this information. The tone receiver associated with each supervisory channel causes the appropriate on or off light to be lit.

The telemetering transmitters in-

termittently key associated transmitters. In the case of level and pressure variables, the duration of the keying is proportional to the value being measured. For rate of flow, the frequency of or number of keyings varies with the value being measured. Particularly on flow measurements, tone transmission multiplexing is almost mandatory in that it permits continuous transmission of totalization as well as the rate. As the receiver bandpass filters are sharply tuned and have a high degree of selectivity, many signals may be transmitted over a single carrier. The receivers perform the respective functions, only when their respective tone signal is received. On ordinary telephone wires a single pair may carry from 20 to 25 separate signals, or functions, simultaneously. Need for more than 25 signals leads to the combination of audio tone with another method of signalling.

CENTRAL CONTROL CABINET handles the functions of 6 stations with 20 pumps and 5 reservoirs. Control equipment in the panels includes provision for handling 7 future pumps.

Pulse Width Selector Systems

The pulse width selector (PWS) system is used between the Central Control Station for one or more remote pumping stations, utilizing a single voice quality telephone pair. Transmission of control commands and supervision is performed by means of pulse coding through the PWS equipment over only two tone channels, one in each direcion of transmission. At the same tank level, discharge pressure, rate of flow and production are simultaneously telemetered by the audio tone multiplexing as described in the audio system.

Pulse width selection could be considered analogous to a pin tumbler lock. The key can only turn (pump respond) when the combination of pins (coded long and short signals) corresponds to the notches (arrangement of relays) in the key.

Any transfer of contacts on a control switch or supervised contacts acts as a signal to the PWS terminal that there is information to be transmitted. This transfer of contacts causes a train of 7 pulses and 6 spaces to be transmitted. Each pulse and each space may have one of two durations, either long or short. Since each pulse and each space carries information and may have either of two states, it is referred to as a binary digit or bit. Thus, we have the possibility of 13 long bits or 13 short bits or any combination totaling 13.

An example is the case of San Gabriel Valley Water Company's system where two pumping stations are controlled on a single pair of telephone lines and has the following assignment of bits: The first two bits are used to establish the address Plant No. 1 or No. 2, the next eight bits are used for point selection, (the particular pump to be altered) and the last three bits are used for "operator" H.O.A. bits. Having a particular code of long or short bits, within the first two bits, the address is established. One or more of the next eight bits would be lengthened in any one transmission to select the point to be operated. One of the last three bits, within the same transmission, would be lengthened to determine which operation is to be performed on the point selector; that is hand, off, or placing the deep well turbine or booster pump under automatic control.

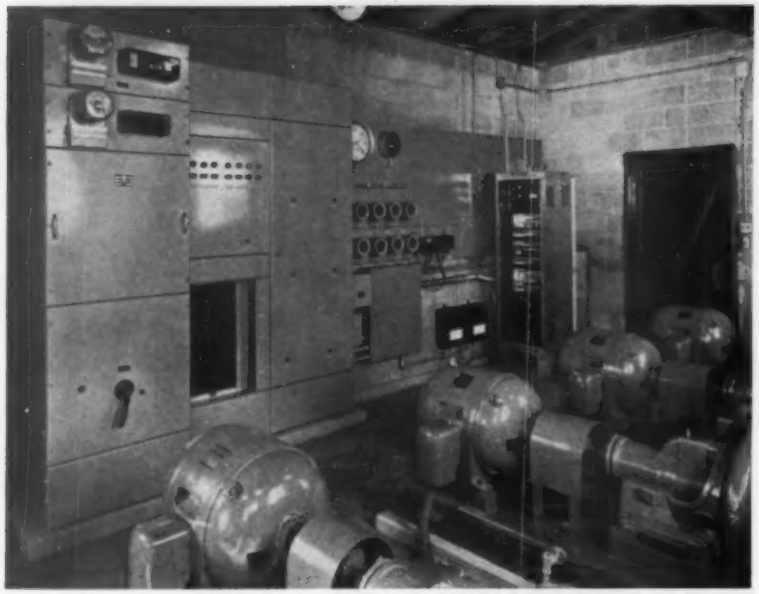
A typical control operation would consist of the operator at the master control station depressing the H. O. or A. pushbutton associated with the deep well turbine or booster to be controlled, and then depressing the transmit pushbutton. Pushing the appropriate H-O-A pushbutton, sets up the right code prior to transmission; i.e., address, point selected, and type of operation. Pushing the transmit button actually sends out the code and puts the command into effect.

For report back or status supervision, there is a direct correspondence between points being supervised and bits. The condition of any particular bit is a transmission, that is, whether it is long or short, carries the information as to whether the corresponding well or booster is on or off. This supervisory transmission will take place immediately upon receipt of a control command or upon any unauthorized change in status of any of the points being supervised. Each supervisory transmission, in the case of plants 1 and 2, has the first two bits assigned to address. This is necessary so that the transmission of the remote station upon reception at the Control Station, will be channelled into the proper set of status lights.

In the event of a simultaneous transmission between the control station and remote station, the remote station will have precedence while the control station will store the command which was to be transmitted until the reception is complete. In the event of a simultaneous transmission between the two remote stations, precedence is given to Plant No. 1 (arbitrarily).

If a change takes place in the status of any of the supervised points without that change being instigated by a central control command, that change in status will be reported on the appropriate indicator lights, but in addition will cause the unrequested change light to be illuminated and an alarm will sound.

Each transmission is always checked for the proper number of pulses at the station receiving transmission. If for any reason a control code becomes garbled and is not prop-



BOOSTER PUMPS, control equipment, switch panel, motor starters, pressure switches, pressure and level transmitters make a compact efficient installation at plant No. 8.

erly received at the remote station, no action will take place. The operator will be aware of this since his status lights will not have changed. Pressing the transmit pushbutton again will send out the same code. If it is desired to have a report-back of all points in the system, for both plants Nos. 1 and 2, the all scan pushbutton is depressed.

If a transmission from a remote station is not properly received at the control station, the operator must be made aware of the fact that the control station was trying to receive a supervisory report-back. In this case, the wrong count light is illuminated. The operator would then call for an all-scan. A reset pushbutton is used to erase the indication of unrequested change or wrong count. The system line failure and power failure alarm are not operated through the PWS system, but through straight tone multiplexing.

The Pulse Width Selector System may be used between a master and one remote station or between a master and as many as 15 remote stations. It may be used as a two-way system for either control or supervision only. The maximum number of points which the standard PWS system can handle is 430 on/off control functions plus 430 supervisory functions. The PWS system can operate as a D.C. system in which pulses of D-C voltage are sent out along the transmission line, or it may be used to modulate a tone channel in which event there is afforded the further opportunity of frequency multiplexing.

We are informed that the PWS portion of our central control system is the largest PWS system in operation. Combined audio frequency multiplexing and PWS now provide central control for 38% of San Gabriel Valley Water Company's El Monte Division pumps. Quotations are currently arriving for control equipment for an additional 20 pumps and 3 tanks at three plants. The Whittier Division with 34 pumps will be considered next. Cost of control equipment for a typical plant of 2 or 3 wells, a storage tank and 4 to 8 boosters has been $5,000 to $7,000. Leased wire service now consisting of a total of three pairs is difficult to segregate on a plant basis because of overlapping use. The cost of the present service totals $87 per month.

Maintenance and Repair

An important consideration in the selection of any piece of equipment is the variety and cost of replacement and shelf parts. In the telemetering equipment selected by San Gabriel Valley Water Company the tone generator units are plug-in type and interchangeable throughout the central and remote panels.

Two types of tone receiver units are used. These also are plug-in type. One spare generating unit and two spare receiving units are all that are required on the shelf. The entire use of vacuum tubes is limited to five types. Six to eight of each appears to be more than sufficient as spares. Tube life is thought to be 8,000 to 10,000 hours. The relay requirements of the system cover a considerable variety so spares are not considered practical. They are however, standard telephone type relays and readily procurable from local suppliers. The manufacturer supplied a test meter which essentially is an AC-DC meter of four ranges together with plug-in ear phones for audio check of tone signals for irregularity. Total investment in parts and test meter was $278.00. A twelve months warranty was provided covering all service and all parts except vacuum tubes.

The number one effect of this installation has been improved service to the customers of San Gabriel Valley Water Company. Under no system of automation can it be conceived that machines will completely replace humans but automatic control equipment may some day come close to eliminating that old element of human failure.

Remote control panel at plant No. 8. This panel relays commands and status of 8 pumps, tank level, discharge pressure and flow rate. The cabinet also contains facilities for 3 future pumps.

Responsibility, preparation, control, accounting and administration procedures of a . . .

Water Works Budget, *for Akron, Ohio*

by WENDELL R. LaDUE, Chief Engineer and Superintendent, Bureau of Water Supply, Akron, Ohio.

RESUME: Mr. LaDue discusses how the Akron Water Supply Department prepares and controls its budget, and explains the accounting procedures used. This paper was prepared as a part of the In-Service Training Course for Water Works Supervisors, East Lansing, Mich., and is published here by permission.

■ THE AKRON WATER supply system includes 2 impounding reservoirs with a third under construction; considerable watershed land purchased in advance for future reservoir purposes; a treatment plant and pumping station delivering the water a distance of 11 miles to the city distribution system; a distribution system of almost 800 miles of mains; several repumpage districts with pumping stations and elevated storage. The water is delivered to about 80,000 consumers through services installed by the utility to the property line at the consumer's expense. Meters are furnished and installed by the utility without cost to the consumer.

The management of the Akron water utility is the Superintendent and Chief Engineer's responsibility. He reports to the Director of Public Service, who in turn reports to the Mayor. The funds of the utility are administered by the Director of Finance of the City and purchases are made by the City Purchasing Agent.

Budgeting Limitations

The budget is a plan of the expenditures to be incurred during a particular period and the income for financing them. Too often when laymen, and some water management officials, speak of "the budget," they neglect or ignore income, the second part of the consideration. Income is an essential item of the budget. Without it expenditures are meaningless.

The preparation and control of a budget requires a system of accounts. Such system will vary with each utility, depending upon the legal control under which the system operates, plus the manager's and local government's desire for detailed information. Therefore, only a brief outline of the Akron, Ohio accounting system will be given.

Budget making and budget control are subject to the many variations established by State authority and to which water works managers, and those trusted with control must conform.

Likewise, the fiscal officer (Finance Director) of the political subdivision determines many factors of the budget making—and for its control—to which the water works manager of the municipal plants must conform in order that the water works budget will conform to and complement the city budget. While some of these factors may seem minor, they are nevertheless numerous. With the usual political turn-over of fiscal officers (usually a political appointee) each with his own idea as to procedural details—the result is oftimes discouraging to water works managers who desire and need a continuing financial record of the management of the utility. Let us consider the following:

1. Is utility private or municipal?

   Private utilities by commissions are subject to state control of the rate structure. Consequently the budget control and accounting are closely supervised as to budget control and budget observance and accounting procedure.

2. Are municipal utilities under the same strict control as are the private utilities?

   This happens sometimes, even more closely and more often.

3. If municipal utilities are not under the same strict supervision as are the private utilities, state supervision will vary from an audit to detect illegal expenditures and the legality of the methods employed for financing them, to the submission of a report in the same form as is required of the private utilities.

With only general supervision by the state, local laws will require that the municipal utility budget tie-in with the city budget, principally because the ownership of the property and the backing for the investments for this property generally lie with the city's

credit. In some instances, Authorities may be established with independent fiscal responsibilties.

When the water utility's fiscal matters are a part of the city's financial pattern, the Water Works Manager's concern and responsibility for the financial aspect of the utility grows as the size and complexity of the utility increases. Often there is a tendency to restrict and detract from his responsibility by transfer of the commercial and financing functions to the City Finance and Purchasing.

Likewise, there may be a constant pressure in effect to divert the utility funds for non-utility purposes, and to the utility personnel to perform duties for "related" city work. In these cases, the water works manager must be on his guard to prevent the utility from being strangled and his ability impaired to operate the utility properly. In such cases, he has sufficient funds to function adequately.

Income Sources

Income may be derived mainly from four (4) sources:

1. Sale of Water—This is the main source of revenue. Likewise, it is a most unpredictable source, and to a great extent may be out of the control of the water works manager. In the mid-west, weather conditions in the summer affect sales of water as well as other commodities. A wet summer as well as a cool one, may cut deeply into the estimated income. Likewise, in an industrial city the general national economy, continuity of industrial production, and labor relations have considerable effect on the utility's income. The rate schedule, while subject to change, should assure and produce on an average, adequate funds over the fluctuations of a period of years. It is not feasible or reasonable to make frequent changes as is done in commercial business.
2. Reimbursement for Recoverable Expenses—This includes consumer services and possibly meters when furnished and installed for the property owner by the utility. Percentagewise this is relatively small (Perhaps 10-15%) and can be adjusted frequently to meet the changes in cost of these items without undue comment.
3. Miscellaneous — These include rents, inter-departmental sales and services, and interest on operating cash in bank or on unexpended bond funds, sale of materials, and other small items of other than water income.
4. Sale of Bonds—Premium and rate of interest reflects the expenditures required for interest and bond retirement payments.

Expenditures Incurred

Expenditures are divided mainly into four (4) classifications:

1. Operation and Maintenance—The item under this classification would seem to be clear. However, the manager must be on his guard in the interpretation of periodic expenses which some may consider "maintenance" and others as "replacement" to be charged to "outlay" in the absence of an actual depreciation reserve. For instance, water main rehabilitation by cleaning and lining.
2. Recoverable Expense—As noted under Income Item, these expenses for consumer services and meters are offset by reimbursement.
3. Plant Expansion—
   a. By Outlay from annual income from sale of water, this expenditure is a "pay-as-you-go" year by year safety valve use of periodic surplus funds over a fixed minimum "nest egg." It automatically provides a reserve for unusual expenses, or decrease in sales and forestalls a demand for a reduction in rates. It may be considered a depreciation fund for that part of the system for which bonds are not being retired as this money is being "plowed-back" into the system. Again it may be considered a bonus in the case of a system which does not need expansion or replacements. After all, are there any such? This bonus might be used for a rebate on one round of billing. This, however, is a dangerous provision as it might spark a drive for reduction in rates.
   b. Bond Fund Expenditures for plant expansion.
4. Capital Expense—
   a. Interest on bonds and notes sold for plant expansion and improvement.
   b. Bond and note retirement.

   Retirement of the bonded debt is essentially a depreciation item. When the bonds for a plant expansion—or replacement — are completely retired, the expansion is depreciated to its estimated life. Retiring bonds coupled with cash payments into a depreciation fund is a dual demand on the finances of the utility and cannot be justified.

Budgeting Procedure

After the budget is fixed, then the approved budget should be presented and accepted before the start of the fiscal year. Too often a water department budget is tied into and considered a part of the general city budget, resulting in a lag of as many as 3 months after the start of the fiscal year before acceptance. In this case, the utility works on month by month "temporary" budgets with the result that contracts for yearly supplies cannot be entered into until nearly one-half year has passed. Since the water utility budget should be entirely separate from the annual city budget which is dependent upon current tax rate, it would be helpful to have the utility budget approved and placed in operation in advance of the general city budget. When the city budget is presented for approval, then the utility budget could be incorporated as a single item without breakdown.

The preparation of the budget involves a review by the manager of the utility with the heads of the various departments using financial and operational statistics for the past several years, thereby forecasting the financial features of the coming year. This procedure involves statistics of water demand, increase in the number of services, need for system expansion and replacements, operational and maintenance costs, with specific knowledge of future wage schedules and materials costs.

With these factors determined, a trial balance is run. Following this, adjustments to bring Expenditures in balance with Income, bearing in mind

a possible use of a portion of the estimated cash surplus obtained at the start of the fiscal year. Arriving at a budget for the year and having it approved is only the start of the problem.

Accounting

A water works utility accounting system must be under the control of the operating manager. As previously noted, the accounting system should be such as to provide the manager with a month by month cash picture of the financial condition of the utility. Another very essential use of this cash accounting system is in a study for rate adjustment. In this connection, a continuing break-down of water consumption by different classes or volume of water used by different consumers in various areas served by the utility is not only of value in rate adjustment, but from the engineering viewpoint, in the study of distribution system expansion. In establishing a system of mechanical billing for my city, this information was provided in the design of the machine. Thus these continuing data are obtained as a product of the customer billing as well as a cash balance.

The funds on which the utility operates are derived solely from the sale of water, and from other operations of the utility. There is no reimbursement from taxes for "hydrant rental" or other sources. Likewise, the utility makes no contribution to the general City operation other than rent for its quarters in the muncipal building. State supervision of financial operations is limited to two-year check for errors or legality of payments.

The commercial section of the water department is divided into the following three subsections:

1. General customer activities except billing and collection.
2. Billing, collecting and control of all cash receipts of the utility. Meter reading is under the supervision of the distribution section. The receipt of all funds and the deposit of them with the finance department is the responsibility of this subsection. Akron has a sewerage service charge and the water department acts as an agent for the City in billing and collecting these funds. The utility is reimbursed for this service. The utility and the sewerage service funds are segregated.
3. General accounting including purchase and accounting of material, payrolls, rents and miscellaneous bills. It does not include billing and collection for sale of water and for service installation.

Billing, Collection and Control of Receipts

The 80,000 consumers are billed quarterly, bills carry a "net" and "gross" amount. The gross amount applies 20 days after the due date of the bill. The city is divided into 9 districts with bills dated 11th, 21st and last day of each month.

The ledger card system for consumer's accounts is used as it is desired to maintain a continuing record of a given account easily available for reference. This is considered very valuable as an aid for good consumer relations. Each sheet contains designation for size of meter which aids the biller to determine the minimum bill for the given service. The filing of the ledger cards in a vertical offset file provides a means for locating unpaid accounts easily and rapidly.

Accounting Office Procedure

Obviously the accounting starts with the meter reader, and his route book is the initial part of the accounting system. Each route book is the primary unit of control. It represents one work day for the reader, and it is the primary unit of financial control. This separation into as much as 450 units reduces the time required to keep the ledger and teller records in balance. The meter reader does not compute the quantity to be billed.

To reduce the need for second trip of the reader to those houses where readers could not enter, a card is left at the door with a request for the occupant to read the meter and send the card to the office. A list of missed readings is in the route book when it is sent to the office. The route book when received is reviewed for stopped meters and as reading post cards are received, the readings are entered on the reader's sheet. Shortly before the route is ready for billing, work orders

Major Classifications General Accounting System

Income

- A. Sale of Water
- B. Reimbursement for Recoverable Expense
  1. Service Installation
  2. Paving Restoration due to service installation
  3. Curb meter installation
- C. Miscellaneous
  1. Rent
  2. Work done for others
  3. Sale of material
  4. Miscellaneous
- D. Rotary or Inventory

NOTE: Each account is further detailed as deemed necessary. The administration account includes not only the ordinary accepted administrative charges, but engineering, commercial office, and meter reading expense. H2—New Service installations; H3—Miscellaneous work for others; J1—Curb meter installations; K1—Miscellaneous. Under outlay are: G1H—Main extensions; G1I—Other system improvement; G1F—Water meters; and G1A to E—Miscellaneous. Under capital are: M1A—Interest; M1C—Bond retirement; Rotary or Inventory.

Expenditures

Operation and Maintenance

- A1 Salaries
- A3 Office Equipment
- A4 Office Supplies
- A5 Miscellaneous
- A6 Auto Operation
- A7 Workmen's Compensation & Retirement Funds
- A8 Taxes
- B1 Impounding Reservoirs Operation
- B2 Impounding Reservoirs Maintenance
- C1 Filtration Operation
- C2 Filtration Maintenance
- E1 Pumping Operation
- E2 Pumping Maintenance
- F2 Distribution System, Operation and Maintenance
- OE Other Expense
- O1 Watershed Property

are issued for rereads. Generally these rereads are but a small percentage of the total number of missed readings on the original route reading.

The route book is sent to the biller who computes the quantity of water to be billed, notes errors, bills the charges, and proves her billing on a special summary card for each route. The proved summary card is sent to the control clerk. The bill is the usual post card utility bill, printed in two parts, the original and a second bill used as a duplicate. This is economical both as to postage and elimination of time required to stuff envelopes. However, past-due bills are sent in closed envelopes.

The billing operation includes the printing of the "duplicate" bill at the time of printing the original. This eliminates errors that might occur in preparing bills for consumers requesting duplicate bills, and the bills sent to consumers delinquent in their payment. This eliminates a large amount of time that would be required to prepare these bills separately.

Cash payments made to the cashiers are balanced to the total of stubs from the receipting machines. The stubs are removed from the machine by the supervisor. Payments received by mail are checked with the corresponding stubs. The stubs are sent to the ledger posters and the receipts are deposited with the finance department daily. The posting to the ledger sheets is made on a daily cash receipt basis from the bill stubs. This posting is checked with the cashier's cash report and stub total.

The route reports from the billers and the daily reports from the cashiers are summarized from the route control's which are consolidated into nine district controls and finally into a system control. At the end of the 20 day net payment period, the difference between the net and gross amounts is picked up from the ledger sheets and posted to the control. The use of vertical ledger sheets filed in off-set position makes it easy to list unpaid accounts. At the same time, the duplicates of unpaid bills are pulled from the file. At the end of a 30-day period the duplicate bill for unpaid accounts are mailed. Twenty (20) days later a "final notice" is mailed and if no payment is made within 10 days a turn-off order is issued.

General Accounting

The necessary auxiliaries to general accounting such as preparing payrolls and record of materials purchased and used is a function of the subsection on general accounting. Bi-weekly payrolls are prepared from approved time slips for hourly rated men and from the established schedule for salaried men. Earnings only are entered on the payroll sheet which are then sent to the City Finance Department for necessary deductions, and the preparation of checks. Employees employment status, salary, and absence records are maintained by this subsection.

The procedure for purchase of supplies is as follows:

1. A request from a section head is approved by the Superintendent & Chief Engineer.
2. A requisition approved by the Superintendent and Chief Engineer, the Mayor and the Director of Public Service is forwarded to the City Purchasing Department.
3. Before the Purchasing Department issues the order for the purchase, it is approved by the City Finance Director, who encumbers the proper fund.
4. When the order is issued, a copy is sent to the water department to form the basis for a departmental encumbrance charge.
5. When material is received, the City Purchasing Department is notified.
6. Approval of invoices and their certification to the Finance Department is a function of the City Purchasing Department.
7. A copy of the paid invoice and city voucher is sent to the water department for record and accounting purposes.

Budget Control

Control of the Budget is a year-long problem for the utility manager. Control of the Budget involves a month by month knowledge of the *cash* status of the various functions involved. The status of financial condition of the utility at the end of each month should be available to the manager not later than the 15th of the following month. Many budget controls by fiscal-minded personnel are not only considerably behind this schedule, but is so broken up that it does not furnish the manager with the necessary up-to-date information for his control of the economical operation of the system. The fiscal-minded personnel consider funds only on a yearly basis, making necessary closing-out and adjustment charges at the end of the year.

Therefore, it is very essential that a budget control for the system on a cash basis be maintained by the utility personnel. The breakdown of this utility control will depend upon the system make-up, and the desire of the manager for that information which he considers necessary for his control of economic operation. Of course, if at all possible this operational breakdown of the utility should be such that the various items can be reconciled with those of the Finance budget.

In like manner, encumbrances against the various items must be followed closely. If not, the manager may find that work will be delayed due to the fact that the given item has the "No Funds" sign which may require transfer of funds before the given materials and equipment can be purchased or funds assigned.

For adequate budget control (which is really a system of cost accounting) inventories are essential. Purchases of materials which normally would be charged directly to an account should first pass through an inventory account if such purchase is for more than a 3 or 4 months demand, and are of considerable value. Cited are such items as coal, pipe, and fittings, service materials, curb meter settings, meters and meter parts. Likewise, an encumbrance item is necessary on the Income item of Reimbursement of Recoverable Expense to cover the backlog of services or meters paid for but not installed. For instance, water mains and services are to be installed in a real estate development or in annexed territory. Money may be received in the fall of the year but the installations are not made until in the spring of the following year. Without an encumbrance account the recoverable operation item will show a large income/expense ratio at first, with a corresponding low ratio later. This encumbrance is as essential as the encumbrance item for unfilled orders and contracts on the expenditure side of the budget. Good budgeting, good accounting, good spending, all are essential items of good management.

Faced With the Continuing Improvements and Expansions of Highway Systems It Is Essential to Have Some Information on the . . .

Responsibility for Utility Relocation

by ROBERT P. HEYWOOD, Esq.
Town Attorney, Town of Colonie, N. Y.

EDITOR'S NOTE: Although the author concerns himself primarily with utility relocation in connection with state highways in New York State, his basic presentation and suggestions should be of nation-wide interest. This paper was presented at a meeting of the Association of Towns of the State of New York.

■ THE GENERAL SUBJECT of state responsibility for relocating municipal public services is one that requires an examination of the authorities with respect to municipalities in general. While the concern here is only with towns, a look at what the cases have said with relation to all municipalities is necessary for a proper understanding of the subject. It has been said that the state has an absolute control of the highways, including streets, even though the fee be in a municipality. Such powers of supervision and control may be exercised directly by the legislature or may be delegated by it to subordinate or local governmental agencies or such authorities as it may deem satisfactory. The state may permit the use of the highways and streets for any purpose not incompatible with the object for which they were established. The power to control highways and to provide for the proper adjustment of conflicting rights and interest therein is a police power. Legislation exercising it need not be uniform throughout the state.

The public easement in any highway includes the right to lay pipe or conduits beneath the surface for the benefit of the public. In 120 U. S. 64 which, incidentally, was not a case arising in New York State, it was said that the right to dig up and use the streets of a city for the purpose of laying water pipes is a franchise which the state may grant to persons or corporations upon such terms as it deems best for the public interest accompanied with such exclusive rights in the grantee as may be deemed best to promote the public health, comfort and safety.

Provisions of Law

With these general thoughts in mind, the statutory provisions of the Town Law of New York State with respect to the installation of municipal services within the rights of way of the state highways and, further, the Highway Law setting forth the powers and duties of the superintendent of public works will be examined. Generally speaking, Section 198 of the Town Law provides that after a water or sewer district has been established, the town board may cause pipes and necessary appurtenances thereto to be laid, relaid or repaired in or under the surface of any highway in the county in which such town is located or in an adjoining county for the purpose of transporting water to a water district in said town and shall cause such highway to be restored to its usual condition at the expense of the district. No water or sewer pipes shall be laid if such a highway be a state or county highway or a highway constructed pursuant to sections 194, 195 and article 6 of the Highway Law of New York State without the consent of the state superintendent of public works.

Section 3 of the Highway Law divides highways into certain classes:

1—"State Highways" are those constructed or improved at the sole expense of the state, including certain highways specified in other sections of the law.

2—"Controlled Access Highways" are those highways entirely or partly constructed, reconstructed or improved at a location where no public highway, theretofore, existed and to which the occupants of abutting property shall have no right of access either as pedestrians or otherwise.

Section 10, subdivision 24, of the Highway Law says that the superintendent of public works shall have power, whenever he deems it is necessary as a result of construction, reconstruction or maintenance of state highways, to provide for the removal, relocation, replacement and reconstruction of water mains, sewer pipes, and any other facilities that are owned by any municipality and are maintained for public use. The expense of such removal, relocation, replacement or reconstruction shall be a proper charge against funds available for the

"The public easement in any highway includes the right to lay pipe or conduits beneath the surface for the benefit of the public."

construction, reconstruction or maintenance of state highways, and such work may be performed by contract or by the use of department forces and equipment and of materials purchased therefor. However, if the superintendent of public works deems it to be in the interest of the public, he may contract with the municipality, upon such terms as he may deem advantageous to the state, to have such work performed (a) by the employment of the forces and the use of the equipment of such municipality and by the use of any material on hand or necessary to be purchased by such municipality, or (b) by such other method as such superintendent of public works shall approve, or (c) by a combination of the methods provided in this subdivision. Any such municipality is hereby authorized to enter into such contract for the purposes of this subdivision. Upon the completion and acceptance of the work such water mains, sewer pipes and other facilities shall be maintained by the municipality. As used in this subdivision, the term "municipality" shall include a public water authority.

Under Section 10, Subdivision *27* of the N. Y. State Highway Law, the superintendent shall have power, upon the request of a municipality, to perform for and at the expense of such municipality, any work of construction or reconstruction, including the removal and relocation of facilities, provided he deems it practicable to perform such work for the municipality in connection with the performance of any construction, reconstruction or improvement. Whenever the superintendent of public works shall approve such a request, he shall make an estimate of the cost of the work which he is requested by such municipality to perform, in accordance with plans and specifications submitted to him by the municipality. Such municipality shall thereupon deposit with the state comptroller a sum equal to such estimate and subject to the draft or requisition of the superintendent of public works. When the work authorized by this subdivision has been completed and the cost thereof shall have been paid by the state, the superintendent of public works shall render to the governing body of such municipality an itemized statement showing in full (a) the amount of money that has been deposited by such municipality with the state comptroller as hereinbefore provided, and (b) all disbursements made pursuant to this subdivision. Any surplus money shall be paid to such municipality on the warrant of the comptroller or vouchers therefor approved by the Superintendent of public works.

"In order to minimize future delays and expenditures necessitated by the moving of such utilities when a highway is improved . . . it is necessary . . . to control the location of such facilities."

Legal Interpretation for Districts

In 1946, the Attorney General made response to the inquiries of the State Department of Audit and Control as to whether any work of construction or reconstruction under subdivision 24 could be performed in "districts" at the expense of the state. The Attorney General's opinion cited former confusion as to the relationship of a water or sewer district to a town. Much litigation had ensued, with the Court of Appeals in the case of Kenwell vs. Lee ruling that an improvement district was only a special administrative area. Before the enactment of subdivisions 24 and 27, by common law, the holders of such facilities located in the public highways were bound to make such changes at their own charge as public convenience and security require. It must be presumed that the legislature, in the enactment of this statute, had knowledge that the public highways had underneath them water and sewer pipes and other facilities belonging to water and sewer districts. The emphasis is placed in the use of the expression *"maintained for public use."* The clear intent was to include as a proper charge against state funds the removal and relocation of publicly maintained facilities and to exclude non-publicly maintained facilities. In another Opinion, also in 1946, the Attorney General stated that subdivision 24 was limited, as to location of the work of the superintendent, to the *state highways.* The Attorney General went on to say that subdivision 27 to Section 10 is unlimited as respects the place of the work except that the work must be done in connection with the performance of any work of construction that the superintendent of public works may be doing pursuant to the Highway Law. The Attorney General at this time also ruled that the word "municipality" included both water and sewer districts and that the powers of the Board of Commissioners were the same as the powers of the town board operating the district.

Position of the D.P.W.

One step further, and to get to the crux of the further problem, examine the position taken by the N. Y. State D.P.W. through the office of the Chief Engineer with relation to the subject which they call initially, "Utilities Along Right of Way of Interstate Routes." On 9/25/56, the Chief Engineer's General letter #56-9, the ruling was set forth as follows: "After consideration it has been decided that except in special cases in which *our* needs must be served the installation of utilities along the right of way of the interstate system and other limited access express-way routes shall not be permitted. Exceptions from this general policy will be granted only by the Chief Engineer and on the recommendation of the district engineer."

On 5/22/57, Chief Engineer's General letter 57-28 on the same subject, the following language was used:

"Obviously there is a need for advanced planning on the part of the towns and need for complete cooperation with the Department of Public Works."

"Since the issuance of Chief Engineer's General letter 56-9 on 9/25/56, the subject of utilities along the right of way of highway routes has received further study. During this same period, several pertinent suggestions have been received from the various district offices. The additional study and the suggestions received indicate that a revision and extension of the policy is desirable.

> ***"Some form of legislation should be considered to give to the towns the right to lay pipe in the highway."***

"In a statement by C. W. Enfield, General Counsel, Bureau of Public Roads, it is pointed out 'the bureau's study indicated that in approximately one third of the State's Highway Construction, progress is often seriously impeded by delay in utility adjustments; that in another third it is occasionally impeded, and in the remaining third delays seldom occur.' We have all experienced the delays referred to in Mr. Enfield's statement and in addition the experiences of several of our districts clearly indicate that drainage has been seriously impaired and pavements and shoulders extensively damaged, by the installation of utilities along these shoulders.

"Therefore, in order to minimize future delays and expenditures necessitated by the moving of such utilities when a highway is improved and to protect our drainage system, shoulders and pavements, it is necessary that the policy be revised and extended to control the location of such facilities.

"Beginning at once the installation of utilities within the right of way on our *non-controlled access State Highways* will be limited to those areas outside of the ditch line. Utilities will, in general, be installed as close to the outer limit of the right of way as possible. The fact that this may be physically difficult to do does not alter the situation.

"In those areas where it is anticipated that pavement widening will be done no permits will be given to install utilities inside of the *new* ditch line. If, in these cases, this new ditch line falls outside existing right of way, no utilities may be installed within existing right of way. The utility company, or owner, should be advised of our ultimate taking so that if he elects to obtain his own right of way, it will not conflict with the future highway widening.

"In cities and villages each case will have to be determined on its merit, keeping in mind the intent of the above policy. In general, and if practical and feasible, pole lines should be placed on the outer right of way line. Sewers, water lines, and underground ducts for cables should be placed back of the curb and properly separated. Sidewalk areas are particularly adapted for the use of these underground facilities since the digging up of these lines for repairs will do much less damage and cause less interference with traffic than if they are under the pavement.

"On State Highways, both rural and urban, our control must be positive and spelled out definitely and in such detail as is necessary to maintain this control. Care should be taken in the back-filling of any such trench in the right of way to *make sure* that the *intended drainage* both surface and subsurface is not interrupted or impaired.

"The instructions set forth in this General Letter are not intended to alter in any way those set forth in my General Letter 56-9 dated 9/25/56. This is intended to amplify and extend the instructions so as to cover our non-controlled access State Highways as well as our Interstate Routes and Expressways."

Effect on Utilities

It should be noted that what started out to be a general policy with relation to limited access highways had now been extended to non-controlled access state highways, and in this last letter the department has taken into consideration the probability that the districts may have to obtain thir own right of way by a private easement. The effect of such a ruling is to place the burden of additional cost of securing private rights of way upon the districts. In many cases, the effect of this ruling would make the cost of installing sewer and water systems for improvement districts entirely prohibitive. The suggestion has been made that this interpretation of the Department of Public Works is too restrictive, expensive, unnecessary and deprives the communities of rights to which they are justly entitled. However, the sections of the Town Law involved used permissive language in that they state that the town board *"may"* exercise the power of causing pipes to be laid below the surface or in any public highway. As a matter of fact, the permissive language is further qualified by the fact that the consent of the state superintendent of public works is required where a state highway is involved. In the two subdivisions of the Highway Law which have been heretofore cited the final decision to expend state money for construction or reconstruction, removal or relocation in state highways is left to the discretion of the superintendent of public works where he deems it necessary. Even in subdivision 7, we must note that the superintendent of public works must deem it practicable to peform the work for the municipality. Obviously there is a need for advanced planning on the part of the towns and need for complete cooperation with the department of public works in determining the routes of proposed expansion or reconstruction of state highways in relation to existing municipal installations and planned extensions of various districts.

Proposed Legislation

As an additional suggestion, some form of legislation should be considered to give to the towns the right to lay pipe in the highway, a right to which they have been traditionally entitled. Also, it should be provided by legislation that the state pay for relocation and reconstruction of public service facilities in the case of highway widening, where the state issued the permit therefor in the first instance.

Accepted testing procedures requiring laboratory personnel and facilities, plus large number of ground water sources to be tested, spurred the development of a . . .

Rapid Screening Test For Cadmium . . . *in potable water*

by MAXIM LIEBER, Principal Sanitary Chemist, Division of Laboratories and Research, Nassau County Department of Health, Hempstead, New York.

■ IN NASSAU COUNTY, N. Y. the presence of Cadmium was detected in some of the ground waters.[1] This chemical contaminant appeared in the ground water aquafiers through the negligent disposal of plating and anodizing wastes. The wastes referred to usually contained either Hexavalent Chromium, Cadmium or combined mixtures of the two toxic ions.

Background

The currently accepted laboratory procedure for the analysis of Cadmium is given in the 10th Edition of Standard Methods.[2] This procedure is long, and requires trained personnel with laboratory facilities. In conducting ground water field surveys for Cadmium contamination, it has been necessary to forward large numbers of samples to the laboratory for analysis. Many of these samples did not contain the metallic ion in question. As a result, it was desirable to formulate a screening test for field work, which would help eliminate the bulk of the water samples which do not contain Cadmium. The procedure devised in this Division is a sample, rapid test which does not require the use of fragile equipment. The necessary solutions are prepared in the laboratory preceding the survey activity.

Reagents Prepared

Stock Cadmium Chloride Solution: Dissolve 1.6296 gm of anhydrous Cadmium Chloride per liter of distilled water. 1.0 ml = 1.0 mg Cadmium.

Standard Cadmium Solution: Dilute 10.0 ml of stock $CdCl_2$ solution per liter of distilled water. 1.0 ml = 0.01 mg Cadmium.

Dithizone Reagent: Dissolve 0.02 gm Dithizone in 200 ml 3N NaOH. Prepare a fresh solution on the day it is to be used.

Color Comparison Equipment: 50 ml Nessler Tubes or 2 oz French Square bottles.

Procedure

Prepare a series of temporary standards by diluting 0.0, 0.5, 1.0, 1.5, 2.0 ml, etc. of the Standard Cadmium Solution with distilled water to a volume of 50 ml. Place in 50 ml Nessler Tubes or 2 oz French Square bottle. These standards represent 0.0, 0.1, 0,2, 0.3, 0.4 ppm of Cadmium, etc. Place a 50 ml sample in a Nessler Tube or 2 oz French Square bottle. Add 2.0 ml of Dithizone reagent to each prepared standard and sample, mix and let stand for five minutes before making comparison.

The presence of Hexavalent Chromium ions does not interfere with the test.

Interfering ions such as Copper and Nickel will darken the color formation making color comparison impossible. These latter samples are forwarded to the laboratory with the positive Cadmium samples for confirmation.

References

1. Lieber, M. & Welsch, W. F., Contamination of Ground Water by Cadmium, Jour. A.W.W.A., Vol. 46, No. 6 (June, 1954).
2. Standard Methods for the Examination of Water, Sewage and Industrial Wastes, A.P.H.A., 10th Edition, 1955.

Table 1

Sample prepared to contain:		
ppm Cr+6	ppm Cd	ppm Cd as observed by test
0.00	0.1	0.1
0.10	0.2	0.15
0.20	0.3	0.3
0.30	0.4	0.4

Table 1 is a prepared series of samples containing varying quantities of Hexa Chromium and Cadmium.

Table 2

Sample prepared to contain:		
ppm Cr+6	ppm Cd	ppm Cd as observed by test
1.0	0.1	0.15
1.0	0.2	0.2
1.0	0.3	0.3
1.0	0.4	0.35
1.0	0.5	0.45
1.0	0.6	0.5

Table 2 represents a prepared series of samples containing a fixed quantity of Hexa Chromium with varying amounts of Cadmium.

At the end of its first decade, the New England Compact Commission can report good progress on obtaining . . .

Clean Waters for New England

by JOSEPH C. KNOX, Secretary, New England Interstate Water Pollution Control Commission, Boston, Mass.

EDITOR'S NOTE: The success of the compact approach to the solution of interstate stream pollution control problems has been effectively demonstrated in the New England States. In this article, the author (who is also Secretary of the New England Water Works Assn.) reviews the history of the New England Compact and its operations and concludes: "The accomplishments of the Commission and the States to date and plans for the future, demonstrate that the States can and are working successfully through interstate cooperation under a long range program to resolve a regional problem which the States are incapable of doing individually."

■ TODAY THE NATION is water conscious and the New England area is no exception. Interest in the conservation of the water resources of this renowned industrial and recreational region through effective pollution control has become one of paramount public concern. No longer is water pollution considered a necessary evil, its control a costly luxury—for pollution control is now recognized as the easiest and most practical method of conserving and augmenting the water resources of the area.

The story of the region's crusade to abate water pollution stems from the New England Interstate Water Pollution Control Compact, a cooperative agreement participated in by the six New England States and New York State, in an area which is virtually a network of waters crossing and recrossing State lines and in several instances forming the boundary between two States.

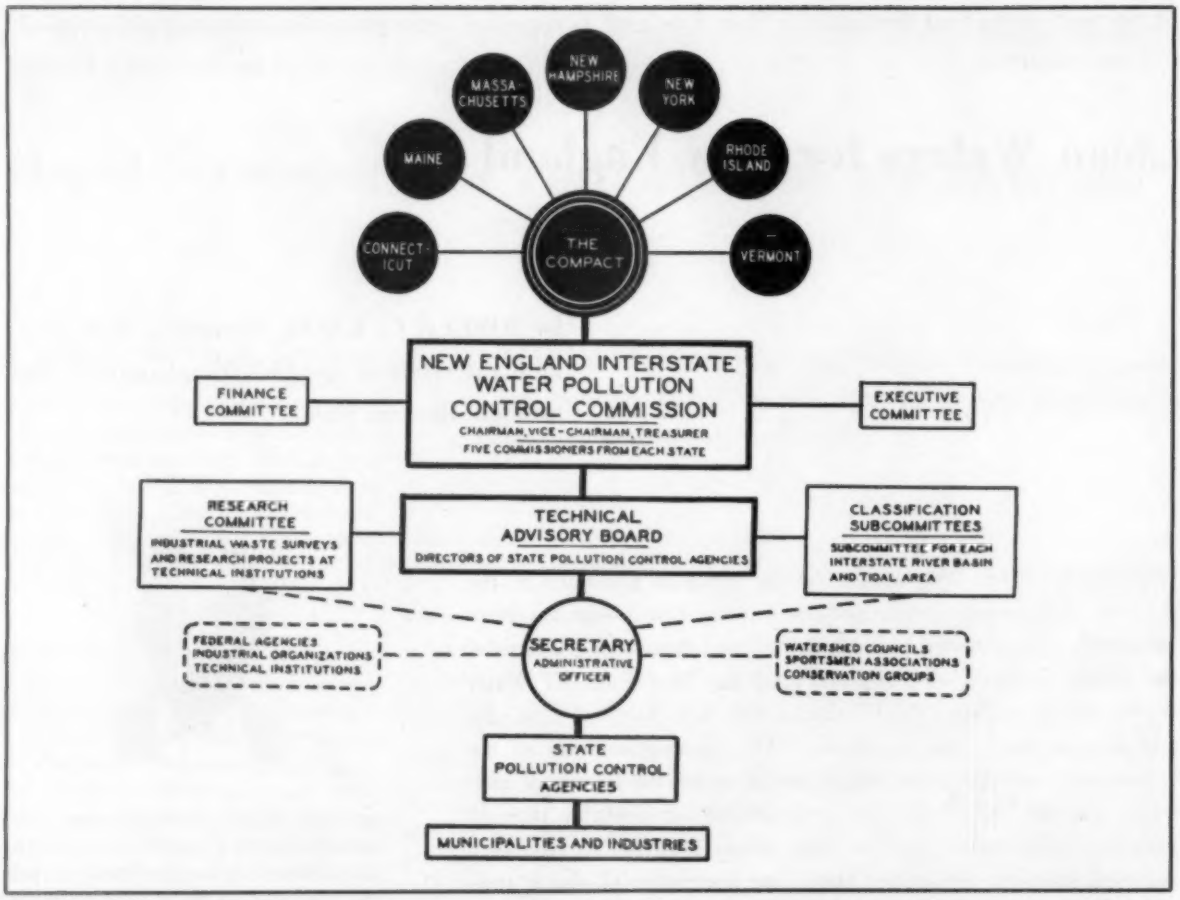
The Compact did not come into being suddenly. Its genesis may be ascribed to the New England Conference of State Sanitary Engineers, which for many years had devoted considerable attention to intrastate and interstate pollution problems in the area. While the demand for regulatory legislation had resulted in the enactment of statutes investing State agencies with certain authority in the control of water pollution, the Conference recognized that the solution of interstate water pollution problems in the area must be a coordinated venture, and that inasmuch as the States themselves, acting together, were in the best position to evaluate their needs in this regard, a compact arrangement was the logical and most democratic approach.

Organized in 1947

In 1947 the New England Interstate Water Pollution Control Compact was drafted and in the same year ratified by the legislatures of Connecticut, Massachusetts and Rhode Island and approved by an act of Congress. New York, which was eligible to become a signatory because of waters in that State common with those in New England, ratified the Compact in 1949. Vermont and New Hampshire became signatories in 1951, and the roster of eligible States was completed by Maine's ratification of the Compact in 1955.

The Compact is administered by the New England Interstate Water Pollution Control Commission, which is composed of five representatives from each of the seven signatory States. The manner in which the commissioners are selected and their terms of office are specified in the ratification legislation of each State. Several of the commissioners are State officials in charge of departments or divisions concerned with pollution control, and the others are appointees of the respective Governors.

The membership of the Commission provides representation of the many interests involved in pollution control, including public health, conservation, engineering, industry and the legal



THE COMPACT is administered by the New England Interstate Water Pollution Control Commission, composed of five representatives from each of the seven signatory States.

profession. An important adjunct to the Commission is its Technical Advisory Board, which consists of the directors of the State pollution control agencies, under whose direction the technical phases of the work are conducted. The operations of the Commission are financed by annual appropriations from the signatory States, based on the population and valuation of each State within the Compact area.

The area embraced by the Compact includes 65,000 square miles with a population of about 9,200,000 and is the second most densely populated area in the United States. It is the most highly developed industrial area in the Western Hemisphere and its economy rests on the base of 24,000 manufacturing plants, their $15 billion output and their $5 billion total annual payroll. The industries are diversified with textiles, metal products, paper and leather goods being the leading products manufactured.

Probably no other section of the country is endowed with such extensive water resources as those which constitute the basis of New England's industrial development, while the recreational facilities dependent on these resources are an integral part of the economy of the area. The extent of the water resources involved in the pollution control campaign is apparent from statistics showing that the Compact area contains about 3,500 square miles of water surface, over 75,000 miles of streams, and has a coastline of approximately 4,600 miles.

Classification of Waters

Recognizing the necessity of a balanced use of the area's waters to meet the various degrees of water quality required for the proper maintenance of the social and economic well-being of the region, the Compact is built around a classification of waters according to highest use. This classification system, which is based on accepted water quality standards, reconciles the conflict of water uses by the assignment of classifications which are deemed to be in the best interests of the public, after due consideration of all factors involved.

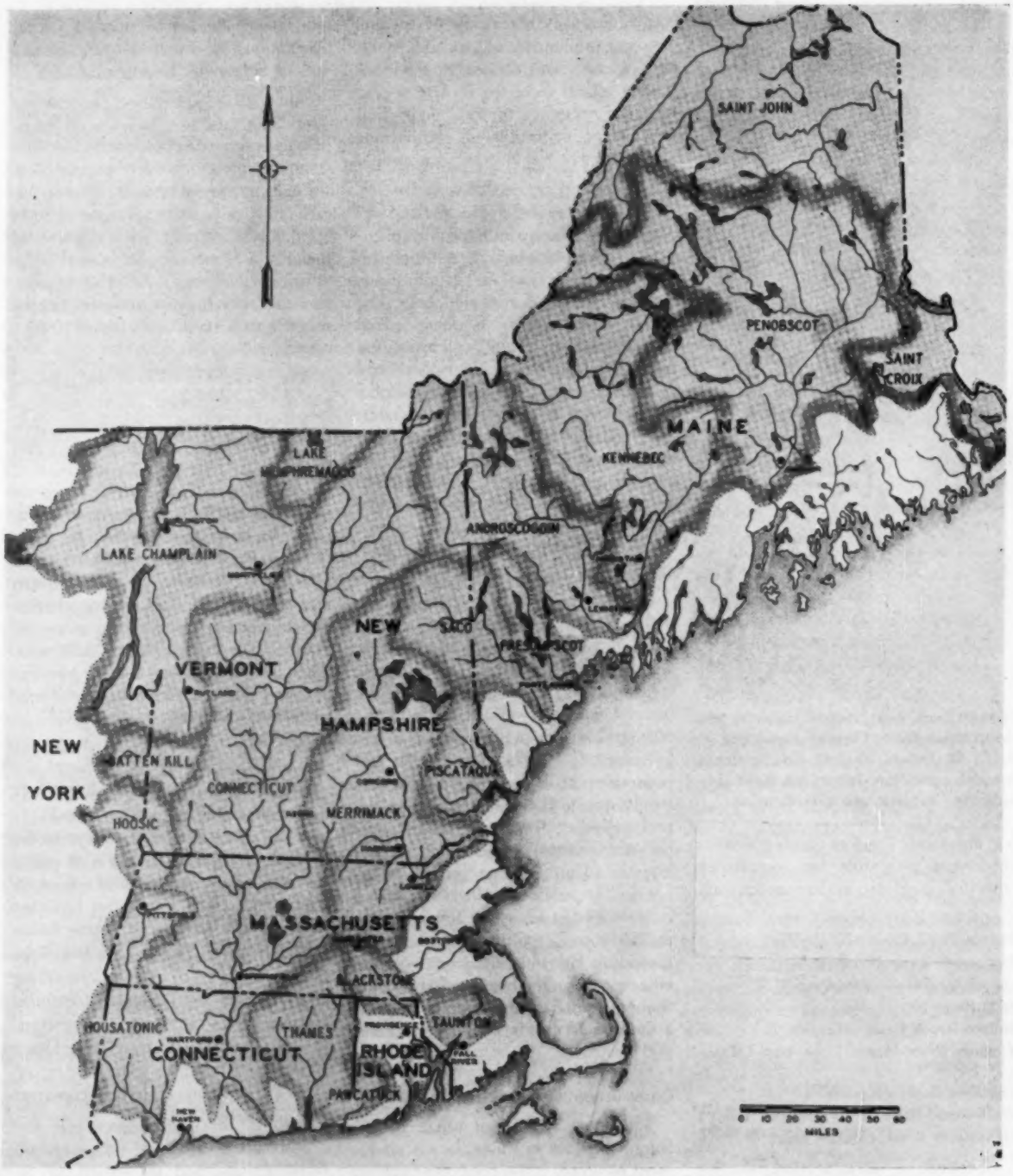
The Tentative Plan for Classification of Waters, which was adopted by the Commission in 1950, defines the classes of water according to suitability for use, as follows:

Class A—Suitable for any water use. Character uniformly excellent.

Class B—Suitable for bathing and recreation, irrigation and agricultural uses; good fish habitat; good aesthetic value. Acceptable for public water supply with filtration and disinfection.

Class C—Suitable for recreational boating, irrigation of crops not used for consumption without cooking; habitat for wildlife and common food and game fishes indigenous to the region.

Class D—Suitable for transportation of sewage and industrial wastes without nuisance, and for power, navigation and other industrial uses.



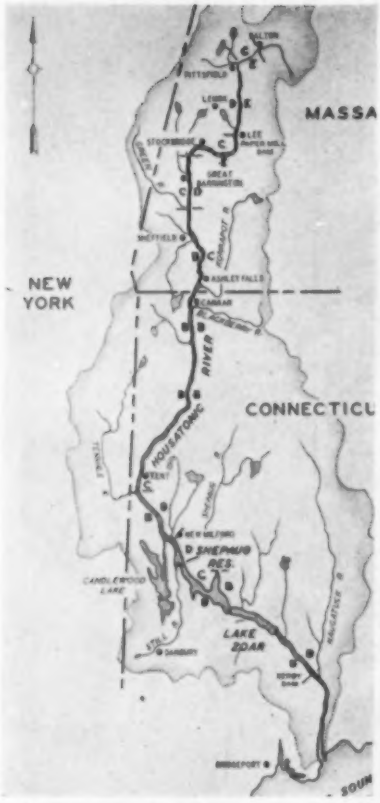
NINETEEN drainage basin areas make up the New England Compact Area.

Class E—Unsatisfactory waters falling below these descriptions; represent nuiance conditions.

Under the provisions of the Compact each signatory State agrees to submit classifications of its interstate waters, according to present condition and proposed highest use, to the Commission for approval. Upon approval it is agreed that each signatory State, through its water pollution control agency, will establish programs of sewage and industrial waste treatment to bring about the improvements necessary to meet the classifications.

To coordinate the work of the States in preparing classifications for interstate waters, the Technical Advisory Board of the Commission designates a subcommittee for each river basin and tidal area. Each subcommittee consists of the members of the Board from the States located in the basin or area.

The Commission, to date, has officially approved classifications submitted by the States for the follow-



EXAMPLE of river classification is the Housatonic River. Classes shown are A, B, C, D; letters on left side indicate present condition, letters on right side indicate "highest use classification."

ing interstate waters, and pollution abatement programs for compliance with the classifications are under way.

Connecticut River (Mass.-Conn.)
Beaver Brook Basin (N. H.-Mass.)
Pawcatuck Basin (Conn.-R. I.)
Quinebaug Basin (Mass.Conn.-R. I.)
Saco Basin (N. H.-Me.)
Salmon Brook Basin (Mass.-N. H.)
Taunton River-Mount Hope Bay (Mass.-R. I.)
Ten Mile Basin (Mass.-R. I.)
Walloomsac Basin in Vermont (N. Y.-Vt.)
Housatonic River (Mass.-Conn.)

Cooperative classification studies have been completed for the Blackstone River (Mass.-R. I.) and the Hoosic River (Vt.-Mass.-N. Y.), and are underway for Lake Champlain (N. Y.-Vt.), the Deerfield River (Vt.-Mass.), the Farmington River (Mass.-Conn.), the Piscatagua River (Me.-N. H.) and the Androscoggin River (Me.-N. H.).

All the States in the Compact area now have effective water pollution control laws as the result of the increasing public demand for clean waters. Connecticut, Massachusetts and Rhode Island were the first to recognize the necessity of such legislation because of concentrated populations and extensive waste-producing industries.

In recent years, New York, Vermont, New Hampshire and Maine enacted comprehensive laws which include the adoption of classifications for all waters of these States. The authority to classify is delegated to State boards in New York and Vermont, while in New Hampshire and Maine classification is a legislative prerogative. The laws of Massachusetts, Rhode Island and Connecticut do not require classification, but the classification plan of the New England Interstate Water Pollution Control Commission is employed as the basis for their stream pollution control programs.

Classification is proving a most valuable asset in water pollution control work on both interstate and intrastate waters in the Compact area because it provides a composite picture of the present condition of a river and the ultimate water quality objectives to be achieved. It presents a feasible and economic plan for pollution abatement, incorporating both the results of comprehensive studies by the State water pollution control agencies and the desires of all interests concerned as expressed at public meetings and group conferences. Classification focuses publicity on a pollution problem by providing the municipal officials and citizens, the industries and conservation and other groups concerned, with a definite basis for supporting remedial measures.

Construction of Treatment Works

The most significant index of accomplishments in the pollution abatement program is the progress made in the installation of sewage and industrial waste treatment facilities. In 1947 only 39 per cent of the total population of sewered communities were served by treatment works. The installation of sewage treatment plants in the ten years since has increased this percentage to 61 which represents a net increase of 56 per cent. With the completion of plants now under construction and in the advanced planning stage, 84 per cent of the total population of sewered communities will be served by treatment plants.

Since 1947 sewage works costing over $200 million have been completed or construction started in the Compact area, included are 66 new sewage treatment plants serving an estimated population of over 3,500,000. These figures are exclusive of the many private and semi-public treatment facilities installed at institutions, schools, housing projects, hotels, motels and recreational and trailer camps.

The greater portion of the municipal sewage treatment plant construction in the Compact area has been in Connecticut, Massachusetts and Rhode Island where pollution control programs have been in effect for many years. In addition to the construction of new plants in these States, there has been considerable work in the past ten years involving the enlargement and modernization of existing treatment facilities providing, in many instances, a higher degree of treatment. This work involves 47 projects in sewered communities with a total population of about 1,500,000.

In Maine, New Hampshire and Vermont the pollution control programs did not actually get under way until 1950 and the primary concern was the classification of waters before pressing for the installation of pollution abatement facilities. Many of the communities in these States have applied for the advance planning loans, available under Public Law 560 of the 83rd Congress, to engage consulting engineers for the design of treatment plants. This program is administered by the Federal Housing and Home Finance Agency; the loans are repayable without interest when construction is started.

Particularly in these States are the construction-grant provisions of the Federal Water Pollution Control Act (Public Law 660 of 1956) stimulating the construction programs. This Act authorizes grants-in-aid to municipalities not to exceed 30 per cent of the cost of construction or $250,000, whichever is the smaller. The eligibility of the communities to receive these grants is determined by the States. For the 1957 and 1958 fiscal years Congress appropriated $50 million and

$45 million respectively, to be allotted to the States on the basis of population and per capita income. A total of $6,781,175 was made available to the States in the Compact area for the year ended June 30, 1957.

An added incentive for communities in Maine and Vermont to proceed with the installation of sewage treatment works was provided by the 1957 legislatures of these States in enacting legislation for 20 per cent State grants to supplement the Federal construction grants. Similar legislation failed of enactment in New Hampshire when a tie vote resulted on the measure. It is anticipated that consideration will be given to this type of State-aid in the next legislative sessions in New York as well as in New Hampshire.

In general, the installation of industrial waste treatment facilities has not kept pace with the construction of sewage treatment works. An accurate presentation of industry's accomplishments is not possible because of the continuing work on long range projects undertaken by many industries. However, it can be recorded on the basis of figures compiled by the States, that 177 industrial plants in the Compact area installed private waste treatment facilities during the past decade and 288 industrial concerns connected to public sewerage systems where, in most instances, their industrial wastes are treated in combination with the sewage at municipal sewage treatment plants.

Industrial Waste Research

In 1949 the New England Interstate Water Pollution Control Commission inaugurated a program of industrial waste surveys, investigations and research to assist the industries of the Compact area in solving their waste treatment and disposal problems. Annual grants for the program were received by the Commission under the Federal Water Pollution Control Act of 1948 until their discontinuance in 1953. Under Public Law 660 of 1956 grants again became available and the program has been resumed on the same scale. For the most part the projects have been sponsored by the Commission under agreements with the University of Rhode Island and Wesleyan University in Connecticut. Since its inception the program has been coordinated with the research work of governmental and industrial agencies to prevent any duplication.

One of the first projects undertaken was an industrial waste survey to obtain an over-all picture of the industrial waste problems in the area and the relative importance of each industry in the pollution control program. This survey conducted by the University of Rhode Island showed that there were 374 metal manufacturing plants, chemical plants and rubber manufacturing plants producing toxic wastes and 1,531 plants producing organic wastes. Of the organic waste-producing plants, the 398 textile mills headed the list, with the 121 paper and pulp mills a close second insofar as their total pollution loads were concerned. Then followed tanneries, breweries, canneries and dairies.

The textile industry being the largest contributor of wastes, special emphasis has been placed throughout the Commission's program on studies of textile mill wastes. A critical review of the literature on textile wastes was made first and then a comprehensive cotton finishing waste study at one of the largest plants of this type in New England was undertaken. The report on the study created considerable interest because it embodied a new principle—the substitution of low oxygen-demanding process chemicals for high oxygen-demanding chemicals as a means of abating pollution. Similar studies were then conducted on woolen mill wastes and the wastes from synthetic fiber mills, in order to cover all the textile fibers. The work on textile waste research may be summarized as follows:

"Results from the three textile waste surveys (cotton, wool, and synthetic fibers) indicate that approximately 80 per cent of the B.O.D. load from most textile mills is due to the process chemicals used to finish the cloth. By replacing high B.O.D. process chemicals with low B.O.D. chemicals, reductions of 50 to 90 per cent may be obtained in any textile mill, regardless of the nature of the fiber being processed."

The Commission now has underway projects covering the design, operation and efficiency of existing textile waste treatment plants and a research project on the lagooning of textile wastes. While continuing the studies on textile mill wastes, the Commission is also sponsoring two research projects of regional significance. These involve studies on the treatment and disposal of the wastes produced by tanneries and dairies. To date eleven reports on industrial waste research in the New England area have been prepared for the Commission. Five have been published for distribution and copies were sent to all industries in the area concerned with the particular subject matter. Due to the demand for these publications in other sections of the country, it has been necessary to have several of the reports reprinted.

In view of the rapid expansion of activities in the field of nuclear energy and New England's bid for leadership in this new era of industrial development, the Commission has taken cognizance of the aspects of water pollution from radioactive materials. Under a cooperative arrangement the Technical Advisory Board of the Commission is now serving in an advisory and liaison capacity to the Atomic Energy Commission in all matters pertaining to water pollution by the disposal of radioactive wastes in the New England Compact area.

All the States in the Compact area have or are inaugurating monitoring programs to obtain "background" radiation counts in the waters of their respective States. Where interstate waters are concerned, the Technical Advisory Board has formulated a plan for the coordination of radiological testing and the exchange of data. In this connection a program has been initiated by Connecticut and Massachusetts for the Connecticut River and its tributaries where several plants utilizing radioactive materials are in operation or under construction.

The nuclear submarine program of the Navy includes the construction and testing of several atomic power submarines at the Portsmouth Navy Yard located on the Piscataqua River which is the boundary between Maine and New Hampshire. The Maine Water Improvement Commission and the New Hampshire Water Pollution Commission have undertaken a coordinated radiological monitoring program to secure information relative to the radioactivity present in these waters prior and subsequent to the installation of the reactor on the first submarine.

Dear Bill: Did it ever occur to you that regulations need planning too?

The other day when talking to a management expert, I was asked point blank: What do you do when the time comes to make procedural changes in your department? Well! I replied quickly, we get right with it . . . everybody gets jumping and stays jumping until we get the changes worked out. . . . Now, I no sooner got those words out until I realized I had said the wrong thing. That 'fella' lectured me for an hour on this "Trial and Error" approach.

I did some reading after this experience and discovered that to begin with:

Rules and regulations need care and planning just as any other phase of municipal operation. Setting the guides up carefully assures us that the purpose for which these rules are being established will be accomplished. Going about it without planning can mean trouble with employees, sloppy self-enforcement and where matters of policy may be concerned . . . interpretation of an erroneous nature by members of the staff.

Here is a check list of 10 factors to consider in adopting any changes in procedures or establishing rules and regulations.

RULE 1—The statement of any policy or rule should be definite, positive, clear and understandable to every one.

This requires exact definition and positive statement. It calls for presenting the regulation in the simplest and most direct manner possible AND in the fewest number of words we can put together to do the job.

The best rules and regulations are always those which are concise and to the point and which leave no doubt in anyone's mind about what to do under the circumstances covered.

RULE 2—Where the rule or regulation sets up a policy for an entire department it should be of such a nature as to readily apply in practices, terms and peculiarities of each particular section of that department.

Each such regulation should be examined for its application in every individual section and not formulated, as is so often done, with just one section in mind. Following this procedure secures easy application in that particular section but makes compliance with the rules and regulations most difficult in all others.

Where allowances are made for such varying conditions then the rule or regulation will not only be easier to apply but it will be drafted in such a form as to be understood readily by everyone concerned.

RULE 3—No rule or regulation should ever be inflexible, but they must possess a degree of understood permanency.

The respect given such rules and regulations by everyone concerned will be in direct proportion to that individual's belief in the permanency of the rule. If the desired ends are to be attained there can never be anything in a rule or regulation which will arouse such a feeling in the mind of any staff employee.

The wording or method of presentation should remove any doubt in the minds of those affected as to the seriousness with which the rule or regulation will be administered. Often that frame of mind is established by how closely we ourselves follow such new rules and regulations.

RULE 4—Stability is an absolute essential; constant change of any rules or regulations makes them valueless.

Rules and regulations should never be established on the spur of the moment or without careful planning for such policies almost invariably require a number of changes. As each change is made total respect for the rules and regulations on the part of employees will vanish.

Any rule or regulation must be thought out and discussed at length before being established to avoid this very factor. "Kinks" therein are much better worked out during this planning period than through actual practice which will require change after change and resultant lack of respect thereof.

RULE 5—Keep the rules and regulations as few in number as possible.

There should be as many points as necessary to cover conditions that can be anticipated but not so many as to make the whole thing confusing or meaningless.

The best followed rules are always those presented in the fewest number of sentences. It is far better to present a basic rule in this manner and supplement details verbally than to try to write everything into the code itself; doing so taxes the memory of any employee to handle the policy as a whole.

By nature we all hate rules and regulations anyway; we actually rebel against long, involved ones.

RULE 6—No rule or regulation should ever be established if the manager is undergoing an emotional period.

Fact and sound judgment are the corner stones of every good rule and regulation. None of us can trust even our own thinking processes under emotional strain. Rules or regulations devised during such periods are bound to reflect these emotions. They are certain to overlook basic facts.

RULE 7—Look at the "other side" before every rule or regulation is established.

We must remember that the other fellow is the one who will have to apply the rule or regulation being devised. We have to be certain that he is capable of doing so . . . we must be sure it will not prove impossible of attainment by the mechanics of his job . . . we must be certain that it is not a direct imposition on any of his or her rights or privileges.

Under dictatorial situations, rules which disregard the other fellow can be enforced and will receive some degree of compliance. But they never have full co-operation which assures their success.

RULE 8—Only in the very rarest of instances should a rule or regulation set forth detailed procedures.

Details should be left to the individual's own thinking processes or to verbal presentation by supervisors who must administer the rules and regulations. Where minute detail is presented, iron-bound procedure is established and conditions of variance which may arise will leave many people helpless and bewildered. The broad and basic policy should be established without doubt . . . then when the unusual occurs the individual can handle the situation under his own devices in accord with this basic policy.

Detailed spell out in a rule or regulation obviously makes it long and involved and therefore more difficult to understand, absorb and remember.

RULE 9—Every rule and regulation should be studied closely as to how it will affect previously established rules and regulations before it is posted.

Attention should be called to any that it supplants and revisions should be noted. Making such a check up beforehand will also eliminate the possibility of hurried changes later when such a conflict is discovered.

RULE 10—Every rule and regulation must comply with existing laws of all kinds from city to federal level and with those affecting employees particularly. Reasons for this point are obvious.

Any suggestions or additions?

Yours,

Joe

Ed. Note: Joe is actually Ernest W. Fair, a technical journalist of Boulder, Colo.

1957 Legislative Activity on Water Rights

(As Reported at AWWA Dallas Meeting)

State	Activity
ALA.	Bill presented to Legislature but no interest shown due to sufficient rainfall.
ARK.	Under rule of prior rights, the Water Districts issue permits.
ARIZ.	Requires issuance of ground water permits in critical areas.
CALIF.	Issues water right permits.
COLO.	Now controls the production and use of all underground supplies.
CONN.	Need shown for broader and more powerful authority for the various water boards.
DEL.	Legislation for establishment of a Water Resources Commission passed one house; currently awaiting passage in the other.
FLA.	Established State Water Board Department.
GA.	Established a Water Board.
IND.	Has same statute as Kentucky.
IOWA	Passed a Public Waters Permit System, headed by Commissioner and Council that is empowered to take testimony under oath, depositions, etc.
KAN.	In 1945, passed Water Appropriation Act. In 1957, passed a new law making all water subject to appropriation permits. In Court case, the rule of "First in use—first in rights" has been declared unconstitutional.
KY.	No change since the 1954 Legislature passed a law declaring all surface supplies as Public Water, the allocation of which comes under the jurisdiction of the General Assembly.
LA.	Passed legislation approving the Sabine River Authority in conjunction with Texas for joint water development and control.
MO.	Recommended legislation not passed.
MINN.	No new laws; all waters are declared public and subject to priority.
MISS.	A prior Appropriation Board was appointed and since April, 1951, any new or increased use of water must be approved by the Board.
MO.	No action.
NEB.	The control of surface water is governed by the "priorities established in use" system. However, a municipal supply can take from a prior user subject to payment.
N. J.	In 1957, the powers of the Water Board were increased.
N. MEX.	Provides for the forfeiture of water rights in the event of non-use, or indiscriminate use.
N. CAR.	Established a Board of Water Commissioners in 1955.
N. DAK.	Underground water supplies as well as surface supplies are now controlled by the Water Commission.
OHIO	In 1955, the Water Rights Report showed that a study was needed and funds were allocated for an inventory survey of water resources. This study is now in progress.
OKLA.	The Water Resources Board controls all water and performs a continuing study to make further recommendations for control.
ORE.	No action.
PA.	No change. Revisions are being considered regarding the issue of permits for new or additional water uses.
S. DAK.	Water rights were established; using the prior use rule.
TENN.	The Dept. of Conservation, Water Resources Division, was directed to make a study and to set policy for long range planning to be recommended to the Legislature.
TEX.	In 1957, the Financial Construction Administration provided for the issuance of bonds for conservation and control of water under the Water Development Board. Also, in emergency session, the Legislation established a Water Planning Act under the State Board of Water Engineers to develop an inventory of surface waters in the State and to submit a report and recommendations.
WASH.	Has established a Task Force for the purpose of setting up and recommending a Water Resources Board.
W. VA.	No Statutory action taken on recommended regulations.
WIS.	An ecort is being made to change from the riparian rights law to the rule of prior use.
WYO.	Recognizes water rights as property rights. Was the first state to pass an underground water law, giving the Water Board the sole authority to issue permits.

In spite of a limited budget and staff, Oregon has developed a varied and comprehensive water and sewage . . .

Plant Operators Short School Program *of interest to both the "old-timer" and the novice*

by FRED C. BURGESS and C. V. WRIGHT. Prof. Burgess is Assistant Professor, Sanitary Engineering, Civil Engr. Dept., Oregon State College, Corvallis, Oregon, and Mr. Wright is presently assigned to the Water Supply and Water Pollution Control Program, Division of Sanitary Engineering Services, U.S.P.H.S., Washington, D. C.

RESUME: In 1955, at the direction of Mr. Curtiss M. Everts, Director, Division of Sanitation and Engineering, Oregon State Board of Health, and Mr. J. F. O'Brien, Chief, Northwest Field Training Station, United States Public Health Service, the authors were delegated the job of revising the State water and sewage works operator short course program. This description of the course revision is intended to present briefly a further stage of development of a successful short course program with a limited budget and staff. The program was designed to provide instruction to plant personnel at all job levels.

■ OREGON had conducted operator short courses since 1949, and by most standards they were very successful. Attendance at short schools had been excellent. Seventy-three water works operators and 24 sewage works operators in the State had qualified for certification under the States' voluntary certification program. Now it was felt that there was a need for evaluation as a natural consequence of development over several years of short courses. Comments from a number of operators indicated that some experienced men were losing interest due to repetition of basic and intermediate material, and that inexperienced operators were being "lost" in the more advanced sessions. To satisfy both observations, it was obvious that some separation of the new operators from the old heads was needed. The aim was to do so effectively without unduly increasing the workload on the short school director or the "staff." The staff in this instance is voluntary and made up primarily of engineers from the State Department of Health and Oregon State College. Several possible arrangements were considered. The system selected was chosen for simplicity and flexibility, while at the same time seeming to accomplish the aims originally decided upon.

Course Organization

The program for both sewage and water plant operators was divided into Basic and Advanced courses to be run concurrently. As only a few public water supply systems in Oregon have filter plants, separate sessions were arranged during a part of each water course for the Purification Plant operators.

For the first course under this system, those operators who had not attended two previous short courses were automatically enrolled with the Basic group. The enrollment in the Basic group was surprisingly large, representing over half the total at the short course.

The Basic course was designed on a two-year basis so that either year can follow the other without loss of continuity. In this way new operators can begin the two-year curriculum each year without penalty to themselves or to those returning from the previous year. The curricula for the two-year Basic sessions, are firmly established and it is expected will require little revision.

Contrariwise, the Advanced courses will be assembled each year according to interests and current problems.

An attempt is being made to prepare material for the Advanced course as a series of "daily themes." That is, most of the topics covered each day have a direct connection; e.g., if chlorinaton were selected as a daily theme, topics such as handling and storage of chlorine, operation and maintenance of chlorinators, breakpoint laboratories, etc., would make up all or most of the day's schedule.

In order to simplify the task of preparing and organizing the material for the Advanced course each year, a series of one-day schedules were drawn up, and brief lecture outlines prepared for the topics included on each daily schedule. These are filed, and when a "daily theme" is selected, can be brought up to date quickly to provide a full day's program for the next short course. The topical outlines are furnished to each speaker as a guide for preparing their participation.

At each short course there are sessions during the Advanced program that are of interest for new operators as well. At these sessions the Basic and Advanced groups are combined.

To smooth the mechanics of regis-

tration, notices were mailed to all plant superintendents well in advance, and cards indicating intention to attend were enclosed for pre-registration. This allowed name tags to be printed ahead of time, and gave a good idea of the number of notebooks to assemble and laboratory setups that would be needed.

Content

From past short school experience it was felt that some instruction in the basic sciences, especially chemistry and bacteriology, was desirable. It was recognized that these subjects could only be touched upon in the time available, so course outlines were prepared that attempted to emphasize basic concepts that provide background to understand and perform standard laboratory tests. Laboratory demonstration and practice is particularly emphasized in the Basic course as indicated by the program schedules for the first year of the basic courses.

Staffing

Resource persons on the program for the Basic courses are usually recruited from the engineering and laboratory staff of the State Board of Health. The district engineers are well acquainted with individual plants and local problems which provide illustrations and help to direct the emphasis of course sessions; and the material presented is given continuity and kept relatively uniform by having a stable group of resource persons for a staff. The engineers from the State functioned in the planning and preparation of the course, as well as in the presentation. Without their full, active participation, the short course program would "die on the vine."

The Advanced course brings in many "outside experts" as well as staff from the State Health Department and the State College. From the point of view of organizing each year's course, utilizing outside resource staff incurs additional work on the short course director, but is well worth the effort. Specialists from other agencies, manufacturing concerns, consultant firms, the Public Health Service, etc., have much to contribute to operator training. To be fair to these people, however, the topic to be covered should be outlined in some detail so that the visiting lecturer can prepare himself fully with confidence. It has been attempted to give each person requested to appear on short course programs:

1. Some background as to why this topic is on the program, e.g., any special problems at plants; or to review any developments since the last short course that might affect this particular presentation.
2. What the average level of knowledge of the subject by the group attending the course will be.
3. The exact time allotted, and whether a question perod is wanted.
4. Facilities such as projectors, blackboards, and flip chart easels that can be made available.
5. A request for papers well in advance. This allows time to make suggestions if the coverage isn't as complete as desired, and the papers can be reproduced and assembled in course manuals.

Short Course Programs—Basic Group

Water Plant Operators		Sewage Plant Operators	
	1st Day		
8:00- 8.40	Registration	8:00- 8:40	Registration
8:40- 9:00	Orientation	8:40- 9:40	New Laws and Regulations affecting Sewage Works (combined with Advanced group)
9:00-10:00	Basic Bacteriology		
10:00-10:30	Break	9:40-10:00	Break
10:30-11:45	Waterborn Diseases and Disease Organism	10:00-11:30	Purpose of Sewage Treatment (a) Diseases (b) Sanitary Authority Function and Program
1:15- 2:30	Bacteriology Standards and Tests of Water Quality	1:00- 2:40	Basic Sewage Chemistry
2:30- 3:00	Break	2:40- 3:00	Break
3:00- 5:30	Bacteriology Lab.	3:00- 4:00	Sewage Works Authorities
		4:00- 5:00	Basic Sewage Bacteriology
	2nd Day		
8:00-10:00	Basic Water Chemistry	8:00- 9:00	Sewage Treatment Plant Fundamentals
10:00-10:30	Break	9:00-12:00	Lectures and demonstration —laboratory tests
10:30-12:00	Chemistry and Physics Standards of Water Quality	1:00- 5:00	Laboratory Practice
1:15- 2:45	Demonstration on Water Tests		
3:00- 6:00	Water Laboratory Practice		
	3rd Day		
8:00- 9:00	Arithmetic of Water Works Hydraulics		(Join Advanced Group) (for reports of work groups) (assigned as part of Advanced Course)
9:00-10:00	Chlorination: Theory of Disinfection		
10:00-10:30	Break	8:00-10:00	Preventive Maintenance Report
10:30-12:00	Practices, Handling, Storage of Chlorine	10:30-11:30	Paints & Lubricants Report
1:15- 2:30	Disinfections of Mains and Wells	1:00- 3:00	Panel on Sludge Digestion
2:30- 3:30	System Hazards & Cross-Connection		

Participation By Operators

In the Advanced Course, the operators themselves have much to contribute from their years of experience, and it was felt that increased participation should be stimulated by planning more panel discussions, work groups, problem-solving sessions, etc. For the fullest participation it is advisable to break into groups of less than ten, and have spokesmen represent each group when reconvening for reports or general discussion. In large groups many people hesitate to express themselves, and as the opportunity to speak out is actually more limited, there is a tendency for side discussions to break out, both of which defeat the purpose of the group participation technique.

A word on panel use is warranted here as this technique has probably been used about as awkardly as any,

Advanced Curriculum

Theme: Well Production

8:00 a.m.	Geological Background: Types of water bearing strata, geologic formations and their significance, arrangements of the earth's layers, the hydrological cycle, etc.
9:30 a.m.	Well Drilling: Methods of drilling, casing, grouting; types of screens; logs; gravel packing. Developing the well—flushing, surging and sterilization.
1:00 p.m.	Testing: For capacity, drawdown and specific capacity. For quality, bact., chemical and physical.
2:00 p.m.	Operation and Management: Sanitary protection, causes of reduced production and remedies, records.
2:50- 3:10 p.m.	Break.
4:00 p.m.	Specifications: Requirements and procedures for plan submission; specifications needed for well drilling contracts.

Theme: The Distribution System

8:00- 9:00 a.m.	Population predictions and estimates of flow quantities.
9:00-10:00 a.m.	Fire Flow and Protection: Underwriters requirements, storage, pump capacities.
10:00-12:00	Mains and Service Lines: Types of mains and service lines; installation (trenching, laying, testing, sterilization).
1:30- 3:00 p.m.	Leak Detection, Line Repair and Maintenance.
3:00- 5:00 p.m.	Demonstration: Main cleaning and leak detection devices.

Advanced Sessions

Theme: Management I

8:00- 9:00 a.m.	Organization: Roles and relationships of state, municipal and district managements.
9:00-10:00 a.m.	Basic organization of the utility.
10:00-10:20 a.m.	Break.
10:20-12:00	Water Rate Structures: Including special water users, wholesaling, etc.; relationship of financing plans.
1:00- 3:00 p.m.	Service Rules and Regulations. Panel: (Members discuss basic service regulations needed, and special problems encountered, such as billing and collecting, service discontinuance, special charges.) Last forty-five minutes open to floor discussion.
3:00-3:20 p.m.	Break.
3:20- 5:00 p.m.	Legal Responsibilities: Obligations and rights of the utility and its customers; review of court decisions establishing legal precedents.

Theme: Management II

8:00- 9:50 a.m.	Office Management: Records and accounting administrative organization.
9:50-10:10 a.m.	Break.
10:10-12:00	Personnel Management: Personnel systems; selection and evaluation of personnel records; placement and utilization.
1:00- 2:30 p.m.	Personnel Management: Job analysis, and work simplification techniques.
2:30- 2:50 p.m.	Public Relations: Planning the program; suggested themes; complaint service.

and yet has proven to be a very effective vehicle of exchanging views and ideas. Although the panelists should be well prepared on their topics, the panel presentation should be primarily an unrehearsed exchange and not a series of ten-minute prepared talks. Neither should it become a free-for-all which usually ends up as a debate between two panelists representing the extremes of opinions. The key to an effective panel presentation is selection of a well informed non-partisan moderator who will stay firmly in control of the discussion. A briefing session between the moderator and panelists is desirable to go over the panel technique and the major points to be covered.

Comments from the operators following sessions involving group participation have been very enthusiastic.

Manuals

A complete set of notes are given to each operator attending the short course at the time of registration. It is both time consuming and disruptive to pass every lecturer's notes around at the time of presentation, and too often notes are misplaced or discarded unless in assembled form.

The manual for the Basic course is now being produced in a bound form. The Advanced material is assembled in looseleaf binders. Both manuals have a number of blank sheets included for notes.

Regional Seminars

To supplement the annual short course program, seminars are conducted throughout the State by State Health Department personnel. These are usually on a specific technique or topic, such as a demonstration of the membrane filter, fluoride determination, role of the plant in civil defense, etc. They are held in the evenings at locations that are convenient for operators from a number of surrounding towns to attend.

Conclusions

From the enthusiastic response by the operators attending the first short course programs under the plan described, it is felt that the efforts involved in revamping the existing program were successful. In conclusion the following points are offered:

1. Operator short courses are needed, and worth the considerable effort required by the "staff"—
2. A short course program and certification program are integral, and one should complement the other—
3. Every short course program should be evaluated regularly to ensure it keeps up with the changing needs. A good short course and certification program can be expected to create many of these needs by advancing the level of operator competence—
4. Practice is necessary, particularly in Basic groups. Too much lecture is murder to a group of men used to being active—
5. Group participation is especially effective with Advanced Operators—
6. One of the most outstanding deficiencies in this field of training is the lack of visual aids, i.e., films, slide series, demonstration units, and exhibits.

Operators of sewage works may find help in this discussion of the effects of . . .

Industrial Wastes *in municipal sewage plants*

Part I

by THEODORE JAFFE, Professor of Civil Engineering, Alabama Polytechnic Institute, Auburn, Ala.

EDITOR'S NOTE: This is another article in a series by the author on fundamentals of sewage works operation. In this first of two parts, Prof. Jaffe reviews some of the characteristics of industrial wastes, the reasons for industrial waste surveys, and some laboratory tests required to handle industrial wastes in municipal sewage treatment plants. This article is directed particularly to persons who have had little or no experience with industrial wastes.

■ MANY MUNICIPAL PLANTS have industrial wastes added after the plants have been built, and this situation can create difficulties. Depending upon the characteristics, volume, temperature, etc. of the waste, and the condition of the sewers and the receiving treatment plant, all sorts of operational troubles may arise.

Characteristics of Industrial Wastes

Industrial wastes may require special attention because they differ from domestic sewage. Among these differing characteristics may be:

1. Large volume per day, or extreme fluctuations in volume at various times of the day.
2. Excessive volumes at certain periods of the year; e.g. any seasonal plant operation such as the citrus concentrate industry.
3. High temperature.
4. High concentration of settleable solids.
5. Acid or alkaline.
6. Organic load (BOD) higher than domestic sewage.
7. Harmful substances in the wastes; e.g. metal salts such as lead, chromium, copper, etc.
8. Grease or oils.
9. Explosive or combustible materials, a possible hazard to sewers as well as interference with plant operation.
10. Odor forming substances or odors.
11. Deficiency in essential nutrients or overbalance with one type of microbial food; e.g. textile desizing wastes having an excess of starch but lacking in nitrogen and phosphorus.
12. Radioactive materials.

Although the above list is not complete, it can be seen that industrial wastes may cause difficulties from the point of entrance into the sewer, through the treatment plant, and into the receiving stream. These difficulties may include hazards to structures, equipment, processes, and personnel, or they may be merely bothersome. In any event, they may require special thinking and special attention.

Industrial Waste Surveys

Generally speaking each industrial waste presents a special, new problem. Every plant waste differs from any other waste even though the industry may be the same. Also, every sewer system, every treatment plant, and particularly every receiving stream is different from any other. Certainly all textile wastes, all pickling wastes, all dairy wastes, etc., have some common industry-wide characteristics; but any one textile mill's wastes will be different from another textile mill's wastes in many ways. Usually these differences are extremely important, and why industrial waste surveys are important.

A waste survey is essential for each new situation. The survey should determine in what manner and to what degree the particular waste is similar to others and also how it differs from any other. These differences and similarities should take into account all the other factors in the over-all specific situation.

For example: a new industry wishes to dispose of its liquid wastes through an existing collection system and municipal treatment plant. Analysis shows the waste to be very acid, with a pH of 2.0, but of relatively small volume.

Some of the over-all factors to be considered are:

1. Is the waste discharged in a "slug," all at once, or over a period of hours? If a slug, at what time of day? (It is easy to see that if the waste is discharged over 24 hours, or at a time of peak flow of sanitary sewage, the effect would be entirely different than if discharged during minimum flow in the sewer.)
2. What change in the pH of the raw sewage entering the treatment will result from this waste?
3. What type of treatment—primary or secondary, sludge digestion, etc.—is used at the municipal plant, and

will there be any effect on the units or the processes?

4. Could the waste be discharged directly into the receiving stream without treatment? This might be possible if there were sufficient dilution (flow) in the stream.
5. Is there another industry nearby producing an alkaline waste? (A combination of these two wastes in a simple holding or mixing tank might result in a liquid with a pH around 7.0 and require no further treatment.)

As a result of the waste survey, the decision can be made as to whether or not the industrial waste can be admitted to the sewer system and the treatment plant, or should it be excluded. Results of the survey will show that if the waste can be allowed into the municipal system, are there any restrictions or qualifications? For example, one waste might be admitted and handled if discharged over 24 hours; another might require separation of "clean," cooling waters to reduce the volume; still another might require neutralization for pH adjustment, and so on. In many communities sewer ordinances are in effect to regulate the discharge of industrial wastes. Some suggestions for these will be discussed later in these articles.

Why Industrial Wastes In Municipal Sewers

Why are industrial wastes accepted into the sewers, if they cause trouble? There are several reasons. First, industry pays taxes. As a tax-payer, industry is entitled to certain services from the community, e.g. drinking water, fire protection, etc. Waste disposal is a community service and should be furnished all tax-payers provided their wastes are not an unreasonable burden.

Secondly, in many instances both industry and the community benefit from a combined disposal system. Industry benefits in better control; possibly lower cost of treatment (by utilizing the nutrients in domestic sewage); no need for separate facilities; and others. The community benefits in more complete treatment facilities; lower unit costs; and the economic value of having the industry in their town instead of some other town.

It should be kept in mind that to the difficulties that industrial wastes may cause in existing treatment plants are different from the situation where a new plant is to be designed and built. Many industrial wastes will cause little or no troubles, if a treatment plant is designed with the advance knowledge that these wastes are to be treated with the domestic sewage at a single plant.

If trouble exists in a plant, how can one tell whether an industrial waste or something else, is the cause? Perhaps the first thing required is some idea of the characteristics of an average sanitary sewage in the town, so that it can be determined whether any industrial wastes are entering the sewers. By sanitary sewage is meant one that contains no industrial waste. In Table 1, are some data for sanitary sewages, based on 100 gallons per capita per day flow. (Note: The average per capita water consumption in the U. S. is now approximately 147 gal per day.)

Table 1

Sanitary Sewage Values

Item	Average[1]	Usual Range
Susp. Sol. (total)	254. mg/L	350-90 mg/L
Susp. Sol. (vol.)	171. mg/L	85-65% of above
Settleable Solids	5.4 ml/L	10-2 ml/L
5 day BOD	262. mg/L	350-80 mg/L
pH	7.3	8.0-6.0
Org. Nit.	22.1 mg/L	30-15 mg/L

[1]See Ref. No. 1

Laboratory Tests

Plant records are a valuable source of information in an investigation of this sort, and point out a need for the gathering and keeping of such records. A good operator should know the color, odor, physical appearance, etc. of the sewage entering the plant. Changes in any of these characteristics can be easily noticed and will show that something different has been run into the sewers. Many industrial wastes cannot be detected this readily and so some routine checking of the raw sewage should be done at all treatment plants.

What testing procedures should be performed in an average size sewage treatment plant? The tests discussed here do not require much expensive equipment, and both the tests and the equipment will be of value in daily, routine operation as well as for industrial wastes.

One of the simpler tests, yet one of value in industrial wastes studies, is pH. The best type of pH instrument for industrial wastes is the pH meter. Colorimetric pH testing often does not work with these wastes because the waste itself may be colored, or it may react with the pH indicators to give off-colors. The pH meter can be operated on batteries or plugged in, can be either for laboratory use or a portable type. It can be purchased from about $100 on up. These are rugged instruments, reliable, and do not require any special training to operate.

For the *settleable solids test* only an Imhoff cone and stand are required. These also are very inexpensive, costing about $15.00. The results of this test, expressed as milliliters of settleable solids per liter, are an indication of the volume of solids that probably would settle out in a sedimentation tank in the same time interval as used in the laboratory test. The Imhoff cone test measures only settleable solids and *not* suspended solids. Also, although this test gives approximately the volume of solids, but tells nothing of the concentration nor the relative composition of the solids, i.e. how much volatile (organic) solids and how much fixed (inorganic) solids. For these reasons, as well as others, the suspended solids test is preferable to Imhoff cone tests.

The *suspended solids* test requires some technique with an analytical balance. In addition to an analytical balance, Gooch crucibles, suction flasks and suction, a drying oven (103°C), and a desiccator are required. This costs about $450.00. If it is desired to determine how much of the suspended solids are organic and how much is mineral matter, then a muffle furnace is also needed. Incidentally, the drying oven and the muffle furnace are used in other solids analyses (e.g. sludge solids) as well as for other laboratory purposes.

For the 5 day, *B.O.D. test* (at 20°C) the major item of equipment is an incubator with a thermostat capable of holding the temperature constant. A reasonable sized incubator will cost from $500.00 on up. In addition to this, special B.O.D. bottles as well as a burette, flasks, and chemicals will be needed.

All of the above items of equipment should be available at any sewage treatment plant and all operators at any plant should be familiar with these tests as routine procedures. The actual steps of the tests are given in "Standard Methods"[2] (industrial

waste analyses are given in a separate section).

Nitrogen analyses are usually run in the larger laboratories, rather than as routine procedures. However, where any considerable amount of certain types of industrial wastes are involved, nitrogen analyses are of great value.

If industrial wastes are a problem, or suspected of causing trouble, the operator should make all the tests mentioned above, including both total and volatile suspended solids. The attempt should be made to obtain daily samples of the raw sewage for at least two weeks. If it is impossible to run daily samples, run as many as possible during one week, then change the days the next week, till each day of the week has been sampled at least twice.

These daily samples should be made by taking hourly samples and then composing a portion of each of these according to the flow at the time. The hourly samples should receive a pH check as soon as possible. If any of the test results vary greatly from the usual values for that particular raw sewage, the operator may suspect that an industrial waste has been run into the sewer system. Further, if the raw sewage entering the treatment plant does have a pH, or B.O.D., or solids content greatly different from the domestic sewage, it may require special attention or treatment.

On the basis of the simpler tests described above, what industries might be suspected when variations from the average are found? Table 2 lists characteristics of some industrial wastes and their effects.

Table 2

Effects of Industrial Wastes

Effect	Industries
pH—acid	Tanning; metal plating; some types of pulp and paper mills; some textile dry mills; chemical industry.
pH—alkaline	Beet sugar (Steffans process); beet sugar-lime drainage; tannery; textile; laundry; milk; some types of pulp and paper mills.
Solids—inorganic	Beet sugar; tannery; citrus; paper and pulp; laundry.
—organic	Sugar; milk and dairy; canning; some textile; meat packing and slaughter-house; fermentation.
BOD	All those under organic solids; pharmaceutical and biological plants; food processing.

Most discussions of industrial wastes refer to "population equivalents," a means of expressing the strength and volume of a waste in terms of people. It is often used to show the effect of a waste when figuring service charges, or the magnitude of a waste in relation to the town's population. A formula for calculating population equivalents is:

$$\text{P. E.} = \frac{\text{5 day BOD (mg/L)} \times 8.34 \times \text{mgd}}{0.17}$$

Only two values are required, the 5 day B.O.D., and the flow in million gallons per day. When those data are put into the formula, the answer gives the number of persons required to contribute a domestic sewage of equivalent strength. For example, suppose an industrial plant produces 340,000 gallons per day of a liquid waste having a 5 day B.O.D. of 2,000 mg/L. When these data are substituted in the formula this industrial waste is determined to be equivalent to the sanitary sewage from 33,360 persons.

With this basic information regarding industrial wastes, the actual effects on sewage plant operation will be the subject of part 2 of this article.

References

(1) "Sewerage and Sewage Treatment"—Babbitt, H. E., J. Wiley & Sons, New York, 7th edit., 1953, pg. 313.

(2) "Standard Methods for the Examination of Water, Sewage, and Industrial Wastes"—Amer. Public Health Assn., New York, tenth edit., 1955.

Cloud Seeding on Hail and Lightning

Dr. Arnold Court, San Francisco, Calif., a meteorologist with the U. S. Forest Service recently stated at a geophysical meeting that in addition to perhaps increasing California's rainfall by 25 per cent, cloud seeding showed promise in reducing the severity of hailstorms and may even curtail lightning.

Dr. Court introduced Dr. Ted Smith, of Meteorology Research, Inc., Pasadena, Calif., the company that developed a method of determining whether a particular cloud formation will produce more rain if seeded, who explained in detail the silver iodide crystal method of cloud seeding.

In reducing hail, using the silver iodide crystal method, the crystals pick up water that otherwise would become attached to little hailstones to make the hailstones bigger. Thus the hailstones are smaller and as they fall, they expose more surface to the air and consequently have more chance of melting.

The role that seeding may have in reducing lightning is not well understood yet, Dr. Smith said.

Education, Training and Utilization of Sanitary Engineers

The National Research Council has available a Conference Report on the Education, Training and Utilization of Sanitary Engineers.

This report is the result of a conference held in Washington by the Joint Committee for the Advancement of Sanitary Engineering, under the auspices of the Subcommittee on Personnel and Training of the Committee on Sanitary Engineering and Environment of the National Academy of Sciences.

The report constitutes a significant comprehensive analysis of the sanitary engineering profession, with specific reference to career opportunities and recommendations on recruitment and educational objectives.

The committee stated that the benefits to be derived from a report of this kind can be realized only if all sanitary engineers—in the university, in industry, in private practice, and in public service at every level—will take every opportunity to press for the implementation of the recommendations made.

Copies of the report are available upon request from the Joint Committee for the Advancement of Sanitary Engineering, 33 West 39th Street, New York.

Natural fibers, man made fibers, and mechanical difficulties all contribute to Buffalo's experience with . . .

FILTER CLOTHS

by GEORGE F. FYNN, Superintendent, Sewage Treatment Works, Buffalo, N. Y.

■ SLUDGE DISPOSAL at the Bird Island Sewage Treatment Plant in Buffalo, N. Y., is handled by means of three vacuum sludge filters 11½ ft x 14 ft, with 500 sq ft of surface area.

Canton Flannel Cloths

At the inception of plant operation, utilization of canton flannel filter cloths was adopted for the filtering medium. Service of these cloths usually ranged from 180 to 210 hours with a maximum of 410 recorded. Chemicals originally employed for sludge conditioning preliminary to filtration comprised 40 per cent ferric chloride solution and milk of lime obtained from the slaking of pebble lime.

Reaction in the conditioning tub results in the formation of calcium carbonate and this latter material becomes imbedded in the interstices of filter cloth. Although this condition can be corrected by spraying the cloth with a muriatic acid solution, it has been uneconomical when the physical character of the cloth was such that the useful life was reached about the same time that a washing became necessary.

Some wool cloths and a blanket similar to that used on a Fourdrinier screen were procured for experimental purposes. Test runs, however, indicated that a change from the canton flannel was unwarranted.

Nylon Cloth

One manufacturer fabricated a 100% nylon cloth for the Buffalo installation. After the first 150 hours of service, this cloth was removed for inspection. The original cloth weight of 60 pounds was found to have increased to 254 pounds. The added weight was due to the imbedding of calcium carbonate in the pores. A complete acid wash restored the cloth to its original condition and it was again put in service. After an additional 309 hours of actual service during which time the cloth was acid washed five times, it was concluded that this particular fabric would not be economically satisfactory and further tests were discontinued. It is possible that more satisfactory service would have been obtained with more porous weave fabrication.

Dynel Cloth

Of more recent date, a dynel cloth was procured. The material was woven in a blanket for complete cov erage of the filter so that it was unnecessary to contend with weakening at seams. The unique property of the fibre has been its inertness to acids, weak alkalies, bacterial decomposition and mildew. Filtrate from the vacuum filter covered with this cloth contained about 200 ppm suspended solids when the cloth was clean. As the cloth became clogged with calcium carbonate, the filtrate showed a suspended solids content of 50 ppm or less. The decrease in suspended solids was used as a guide to schedule acid washing of the cloth.

A history of actual operation and maintenance requirements during the period the cloth was in service is portrayed in the following:

Dynel Filter Cloth

Total Hours of Service	Corrective Measures
558	Acid wash
732	Wire replaced
907	Intensive water wash
1042	Acid wash
1266	Acid wash and rewiring
1582	Acid wash
1830	Acid wash and rewiring
2091	Acid wash
2361	Acid wash
2559	Detergent wash and rewiring
2587	Wire loosened and rewound
2807	Acid wash
2953	Cloth removed

Review of the foregoing indicates that acid washing was required after usage of from 224 to 558 hours. Failure of the binding wire occurred after from 534 to 732 hours.

Normal operation is on a 5-day week schedule with a 48-hour shutdown period following continuous service for approximately 120 hours. The filter unit is washed thoroughly with plant water at the end of the operating week spraying with pressures at 60 to 90 pounds. The take-off blade for sludge cake is constructed of plastic material and under some conditions it has been necessary for the blade to be pressed rather tightly against the blanket with consequent abrasive action on the cloth.

Mechanical Difficulties Hinder Test

Discontinuance of usage of the original trial blanket was not occasioned entirely by the lack of further serviceability. A vexatious problem was encountered that required complete inspection of the filter units. It was discovered that copper piping and tubing within the filter drums had both corroded and eroded with subsequent formation of holes at joints and rounded portions. It appeared that the application of a vcuum created conditions whereby the circumferential surfaces of the filters were distorted permitting loosening of the wire. It was necessary to replace a number of filtrate tubes in each unit.

Davyhulme Plant Conversion

On the basis of performance given by the original dynel blanket, additional cloths were acquired. Inasmuch as necessary repair and maintenance of the filter units had not been fully completed, filter performance was erratic for a certain period of time. The next five cloths used furnished respectively 1791, 1892, 1629, 2293 and 1873 hours of service. Currently all three filters are covered with dynel cloths with several hundred hours of service on each unit.

With an increase in unit cost of cloths of approximately 200 per cent, an increased useful life of over 800 per cent and concomitant economy due to less frequent windings and shutdown periods, the transition from canton flannel to dynel filter cloths has proved beneficial.

Good planning, good workmanship, and good inspection are important in the . . .

Construction of Sewers

by L. K. CRAWFORD, Partner,
Crawford, Murphy, Tilly, Consulting
Engineers, Springfield, Ill.

EDITOR'S NOTE: This article was presented as a lecture at the annual Short Course for Sewage Works Operators held under the sponsorship of the Illinois State Department of Health at the University of Illinois. The basic concepts, presented with illustrative diagrams, stress the factors and considerations necessary in sewer construction.

■ IT IS NOT POSSIBLE to condense into a few short pages all of the material that has been written on the design and construction of sewers. Therefore, it is necessary to limit this discussion on sewer construction, rather than hoping to cover the entire field.

For purposes of this discussion it is assumed that the sewage works operator might be called upon to build, supervise, or inspect the construction of sewer jobs. It is also assumed that the city officials depend on him to see to it that the local plumbers do a first-class job of making connections and building service sewers.

It is also assumed that he will not be building sewers larger than 15 or 18 in. and that the depths will not be greater than, say, 15 ft. The larger and deeper sewers present special problems that are not be covered here. Therefore, neither the design of sewers nor the techniques of setting grade stakes are considered. The matters discussed, however, apply equally to clay or concrete sewers.

Importance of Good Construction

Before getting into the details of sewer construction, it might be well to consider why good construction is important to the sewage works operator.

The first reason is that good construction will minimize maintenance. That is important; directly to the man who must maintain the sewers, or indirectly if high maintenance costs take money from the city treasury that should be spent for improvements or for salaries at the plant. Poor construction leads to cave-ins and to root growth entering the sewer.

The second reason is that infiltration can be greatly reduced by good workmanship. To accomplish this requires good specifications and good construction supervision. Many of the newer specifications for sewers contain provision for infiltration tests of completed lines in order to encourage good workmanship on the part of the contractor. A common limitation is that the infiltration must not exceed 10,000 gpd per mile of sewer.

It must be remembered that once the sewer is covered up, it is pretty hard to do anything about sloppy work. If the job is poor, the chances are good that it will be a headache for the town for many, many years.

Importance of House Sewers

The part of the sewer system that ordinarily gets the least attention is the house sewers. Just how important are the house service sewers to the sewage works operator.

A typical example would include a block 300 ft long. The streets are 80 ft wide and the sewer is constructed in the street. If the lots are 50 ft wide, there will be 12 lots (6 on each side). If the houses are set back 40 ft from the property line, each house service

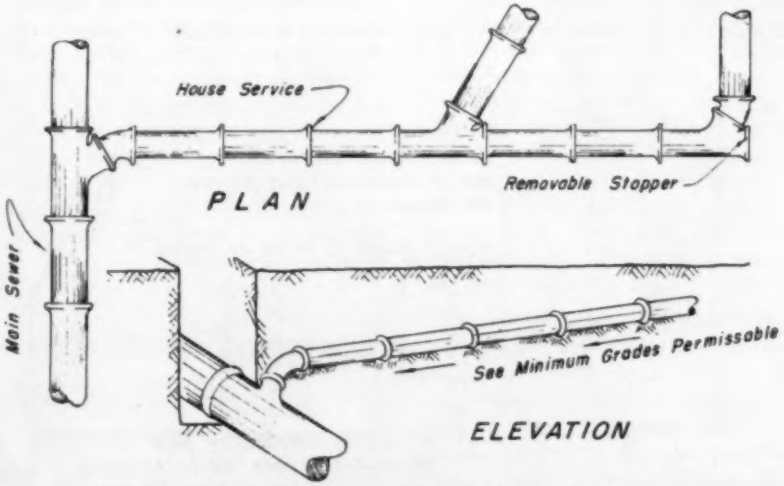


FIG. 1—ALIGNMENT of sewers; note straight line with provisions for cleaning. (Adapted from Clay Products Assn. data.)

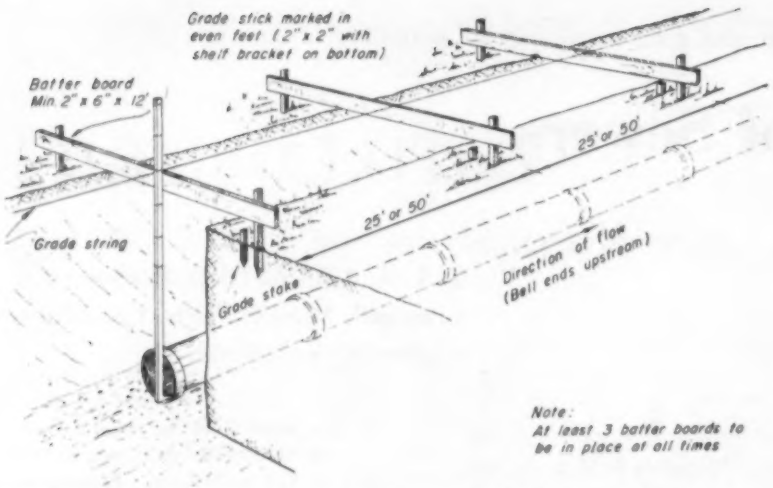

Grade stick marked in even feet (2" x 2" with shelf bracket on bottom)
Batter board Min. 2" x 6" x 12'
25' or 50'
25' or 50'
Grade string
Grade stake
Direction of flow (Bell ends upstream)
Note:
At least 3 batter boards to be in place at all times

FIG. 2—METHOD of transferring grade to sewer. (Adapted from "Clay Pipe Engineering Manual.")

will be 80 long. All houses being connected, there will be a total length of house services of 12 x 80 = 960 ft for the block. The main sewer will be 380 ft long from the center of one street to the center of the next. In other words, the length of house services is 2½ times the length of the main sewer. Of all the sewers in a town which contribute flow to the plant, at least ⅔ of the total length probably would be private sewers.

Estimates of the amount of infiltration in existing systems vary over a wide range. Authorities disagree on this point, but many will agree that the amount of infiltration is controlled by the length of the sewers or the number of joints, rather than by the size of the sewer; in other words, as much infiltration can be expected from a mile of 6-in. sewer as from a mile of 18-in. If inspection is lax, there probably will be more infiltration from the 6-in. sewers. The reason for this argument is, of course, that although larger sewers have larger joints, it is easier to make a good joint on a large sewer than on a small one.

At this point it would seem wise to stress the importance of having a good permit system so that no taps can be made without authorization, and so that inspection is necessary before the excavations are backfilled. It is virtually impossible to control the quality of the work unless the inspection force has some legal authority.

Changing Economic Conditions Affecting Sewer Construction

Many changes are being experienced in the methods of sewer construction due to present-day economic conditions; because of the high cost involved, contractors have been looking for ways to cut corners. This fact must be recognized, because there must be constant alertness that the corners are not cut in the wrong places.

The principal reason for the trend is, of course, the high cost of labor. Contractors are devising means of reducing the man-hours on a job. They no longer want to have a man in the trench painstakingly shaping the bottom to fit the shape of the pipe; they must save time on making joints; they certainly do not want to hand-tamp the backfill around the pipe (or even machine tamp, for that matter); and they wouldn't consider backfilling with hand shovels.

Another noticeable factor is that contractors want to economize by using equipment that is versatile and can be used on more than one type of work. As a result, the back-hoe is used more and the trenching machine less. The result is less control of the depth and alignment, and wider trenches, because the contractor would rather move dirt by machine than put in expensive sheeting.

Importance of Planning

The need for engineering studies and over-all planning cannot be too strongly emphasized. Although this discussion covers sewer construction techniques, it must be borne in mind that the design of sewer systems or portions of systems is an engineering job. The decision to save money by not having adequate engineering studies made is all too often a very

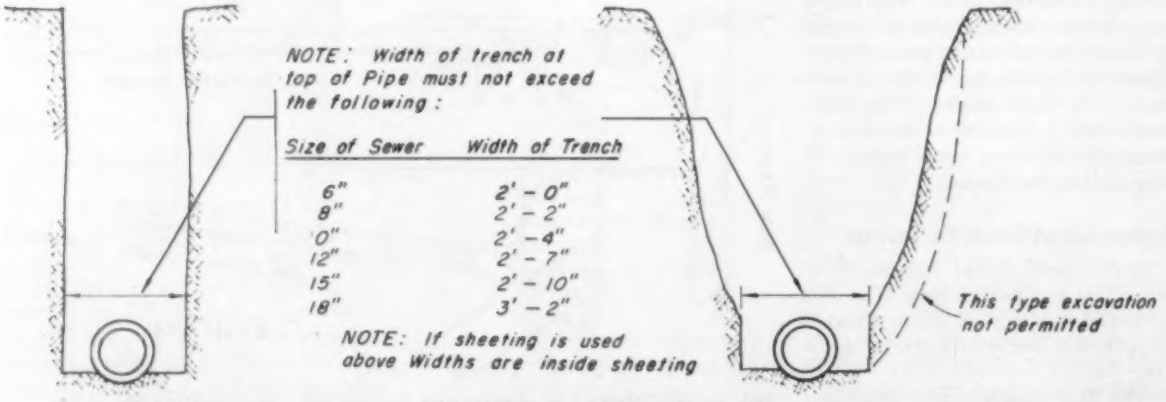

NOTE: Width of trench at top of Pipe must not exceed the following:
Size of Sewer
Width of Trench
6" 2'-0"
8" 2'-2"
10" 2'-4"
12" 2'-7"
15" 2'-10"
18" 3'-2"
NOTE: If sheeting is used above Widths are inside sheeting
This type excavation not permitted

FIG. 3—TRENCHES for sewers.

expensive decision in the long run. It is obvious, for instance, that any construction should fit into an overall plan in order that progress can be made in an orderly fashion.

Alignment of Sewers

Older sewer construction practice required that when the sewer was completed, inspection included dropping a light down one manhole and sighting up the barrel of the sewer from the next manhole. The principal advantage of this requirement was that poor construction could sometimes be detected that would otherwise go unnoticed. Very few sewers of the smaller sizes are built to that precision nowadays, regardless of what the specifications state. Such precision is not considered necessary by many people. The principal consideration is that the alignment be such that the sewers can be readily cleaned or rodded (Fig. 1). In general, there should be no break in grade or alignment between manholes for sewers 24 in. and smaller in diameter. Manholes for these sizes should not be more than 400 ft apart. The alignment of the sewers should, of course, be reasonably good in order that joints fit together properly.

Grade

In supervising construction, it is well to be certain that the pipe is laid to proper grade (see Fig. 2), particularly if the slopes are fairly flat. A hump in a sewer line can be the cause of repeated maintenance calls and expense.

Experience has shown that a flow velocity of about 2 ft per second will keep a pipe scoured and prevent solids from settling out. Experience has shown that sewers laid on grades sufficient to give this velocity when flowing half full will give little trouble from solids settling out, even though the actual flow is normally lower a good portion of the time. The following minimum slopes are acceptable:

Sewer Size, in.	*Minimum Slope, Feet*	*per 100 ft*
6	0.6	7¼
8	0.4	4¾
10	0.28	3⅜
12	0.22	2⅝
15	0.15	1¾

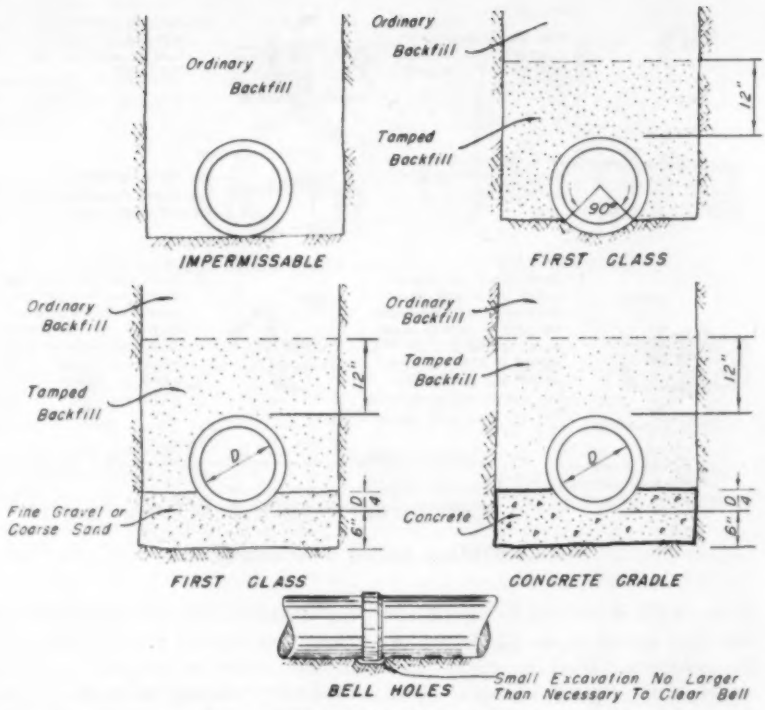


FIG. 4—TYPES of pipe bedding.

Wherever practical, slopes should be greater than the foregoing. For instance, a desirable grade for a house service is ⅛ in. per foot, or about 1 ft in 100 ft.

There is seldom any need for concern over maximum grades in sanitary sewers. Experience has shown that even very steep storm sewers show little wear because of high velocities.

The techniques used in getting the grade from the engineers' grade stake to the sewer may be of concern to those charged with inspection. Some contractors do not want to take the trouble to set up batter boards, but insist that they can do as good a job with a string on pegs driven into the sides of the trench. The only satisfactory way of doing the job is to use batter boards and to require that not less than three be in place at all times. This practice will greatly assist the inspector because he can easily check to see that the grade is correct. It also, in many instances, picks up errors in leveling or computing the cuts.

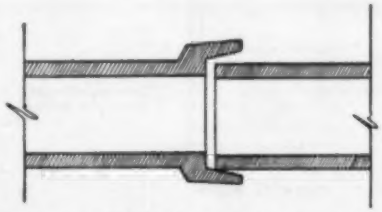


FIG. 5—SECTION through pipe joint without packing.

Trenching

The old way of digging sewer trenches was, of course, by hand shovel. If the depths were over a man's head, the trenches were sheeted and braced with anything from skeleton sheeting to solid sheeting. The trenching machine, of course, is especially built for the job. It excavates a vertical trench of uniform width and is easily controlled as to depth and alignment. The trench, of course, must be sheeted and braced, although usually not to the extent necessary with hand work because the excavations aren't open as long.

Contractors more and more are coming to use the back-hoe for trenching. The principal reason is that it is a more versatile piece of equipment. When they finish a trench job, they can change the boom and have a shovel, a crane, a dragline, or a pile driver. Nevertheless, the tendency with the back-hoe is toward sloppy

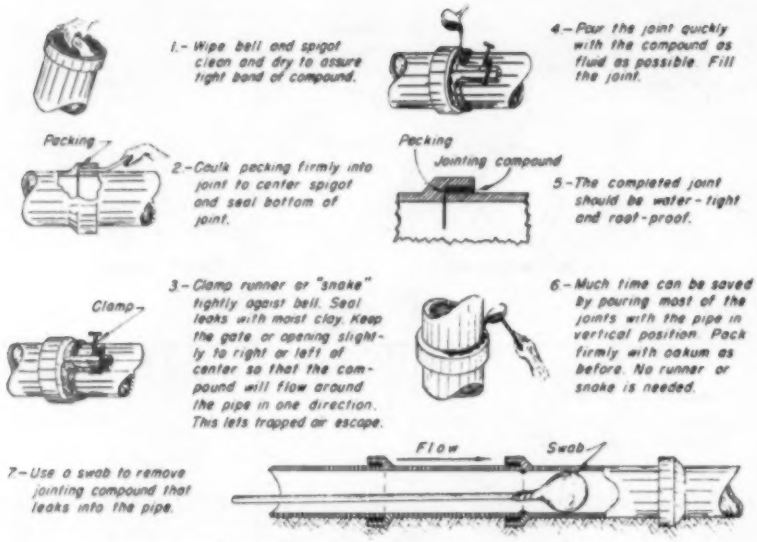

1.- Wipe bell and spigot clean and dry to assure tight bond of compound.
2.- Caulk packing firmly into joint to center spigot and seal bottom of joint.
3.- Clamp runner or "snake" tightly against bell. Seal leaks with moist clay. Keep the gate or opening slightly to right or left of center so that the compound will flow around the pipe in one direction. This lets trapped air escape.
4.- Pour the joint quickly with the compound as fluid as possible. Fill the joint.
5.- The completed joint should be water-tight and root-proof.
6.- Much time can be saved by pouring most of the joints with the pipe in vertical position. Pack firmly with oakum as before. No runner or snake is needed.
7.- Use a swab to remove jointing compound that leaks into the pipe.
Packing
Clamp
Jointing compound
Flow
Swab

FIG 6—STEPS in making a hot poured joint.

work. A lot of dirt can be moved and still keep ahead of the tile layers, so the contractor likes to dig a wide trench with sloping sides and eliminate the need for sheeting. It is hard to hold a true grade with the hoe because each bite is controlled by the operator. A really good operator, of course, can do a pretty fair job.

An important item to watch is the width of the trench at the top of the pipe (Fig. 3). The maximum width at this point is important because it controls the load that will come on the pipe due to backfilling. If the trench is too wide at the bottom, the pipe may be permanently damaged before it is put into use.

Bedding

In order for the pipe to support the weight placed on it, it must be properly bedded for its full length. It is not sufficient to have a flat trench bottom. The bearing must be shaped to fit the contour of the pipe. This can be done by shaping the earth, by placing the pipe on a sand bed, or by placing it on a concrete cradle. Figure 4 shows four types of bedding. At ordinary depths the first class of bedding will be sufficient. At extreme depths, or because of unstable bottom, it may be necessary to use a concrete cradle.

Another important item is that of bell holes. They are necessary to see that the weight (earth pressure) is taken by the pipe and not by the bell. They must not be too large, or they will take up too much of the bearing area.

Joints

A number of materials have been devised for jointing sewer pipe. Among these are: cement mortar, hot-poured bituminous, pre-moulded joints, rubber rings, and cold-applied bituminous.

For sanitary sewers, cement mortar joints are not good; mortar shrinks when it cures and a crack is left just large enough to let in roots and, of course, water. In addition, a good joint cannot be made without a lot of care (Fig. 5). It is particularly difficult to make a good joint in a wet trench.

Hot-poured joints (Fig. 6) are perhaps the most popular, although they have limitations when used in wet trenches or in cold weather. The cold-applied joints are gaining favor. They set up in water and work well in hot or cold weather. One important consideration in any joint is that it exclude roots, either by being too hard for the roots to penetrate or by containing a chemical which will prevent root growth.

With most jointing materials it is necessary to use a packing to center the spigot in the bell. One exception is concrete pipe of the smaller sizes, sometimes made with a self-centering joint. Figure 5 shows what happens when the spigot is not centered. Jute or hemp have been widely and almost exclusively used as joint packing materials for many years. Recently, an asphalt-impregnated braided packing has been put on the market which appears to have many advantages over jute and which is claimed to be no more expensive.

Manholes

Brick manholes are almost a thing of the past. Most of the manholes built today are made of precast concrete rings or concrete blocks (Fig. 7). These manholes are easily installed and save a lot of labor on the job. When rings are used, the steps are cast in the ring. To minimize infiltration, concrete block manholes should be plastered on the outside with a ⅜-in. thickness of portland cement grout. Manhole steps should be of cast iron or aluminum. The steel rods formerly used are a safety hazard after a few years.

Manhole frames and covers are almost always of cast iron. For light traffic or no traffic, a casting weighing about 325 lb is sufficient. For heavily-traveled streets, the castings should be heavier, up to 450 to 500 lb.

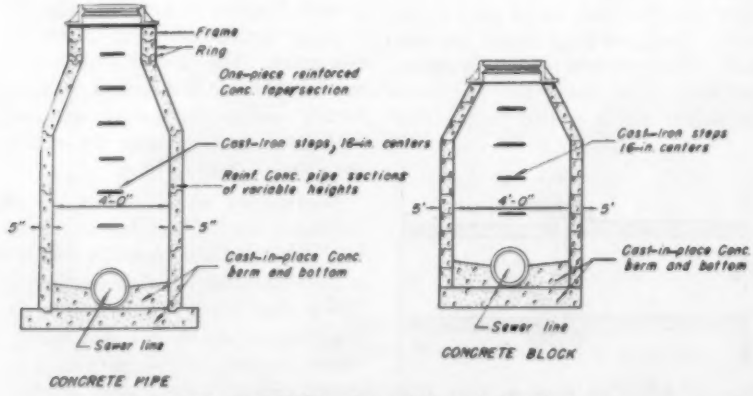


FIG. 7—TYPES of manhole construction.

Taps to Existing Sewers

One of the greatest contributors to caveins in old sewer systems is poor connections of services to the main sewer. Wherever possible, of course, taps should be made at an existing Y fitting, but if that is not possible it is necessary to break into the sewer. (The following are a few rules for making taps (Fig. 8):

1. The connection should be made in the upper half of the sewer.
2. The connecting pipe must not protrude into sewer.
3. The main sewer must not be weakened unnecessarily; if so weakened, it must be reinforced.
4. The weight of the connecting tap must not be supported by the main sewer.
5. No connection should be permitted to be backfilled until it has been properly inspected and approved.

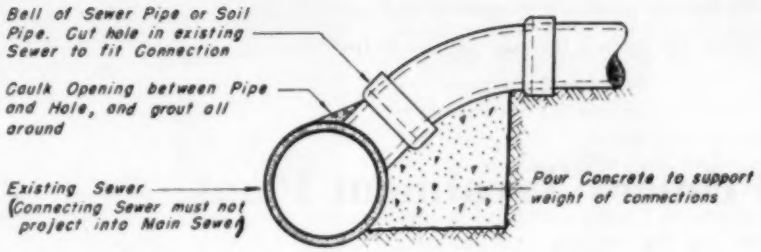

Bell of Sewer Pipe or Soil Pipe. Cut hole in existing Sewer to fit Connection
Caulk Opening between Pipe and Hole, and grout all around
Existing Sewer (Connecting Sewer must not project into Main Sewer)
Pour Concrete to support weight of connections

FIG. 8—METHOD of connecting house service line to existing sewer.

Backfill

It is extremely important that sewer trenches be backfilled properly. Otherwise, the pipe may be broken before it is put into use. Even in this machine age the portion on each side of the pipe and to a point about 12 in. over the top of the sewer should be filled by hand, and preferably tamped. Care must be taken that the backfilling operation does not disturb the pipe and that large clods or rocks do not fall on it and damage it. If granular material is imported for backfill, the tamping may be eliminated.

If prevention of settlement is important, such as where pavement is to be placed over the trench, the best method, and probably the most expensive, is to tamp the material in thin layers and at proper moisture content. Tamping at the right moisture content requires close supervision. Often, in cases of this nature, the excavated earth is hauled away and the backfill is made with sand or gravel. In most cases, where the trenches are on secondary streets, it will be cheaper and more expedient to backfill by ordinary methods and place a temporary surface for the first few months, during which most of the settlement should occur.

Water settling by jetting or ponding has been widely used to compact backfill in trenches. If the material is clay this practice should be avoided, because the loads transmitted to the pipe might be several times the normal earth loads. The reason is that the water lubricates the sides of the trench by making the clay slippery and the excess water in the soil forms a mud that acts more like a liquid than a solid. The weight of the whole mass is concentrated on the pipe, especially if the sides of the trench are sloping. Water settling in clay soils is not recommended if the depths are greater than 8 ft. If the soil is sand or gravel, water settling is ordinarily good practice and is probably the best way of getting settlement.

Record Maps

It would be hard to over-emphasize the importance of keeping good records of underground utilities. This is one matter that seldom gets enough attention, and frequently gets little or no attention. The cost of keeping the records will be saved many times over in the future, for sooner or later someone will need the information and it may cost a lot of money to get it.

Sewer records should show the size, type, depth, and date of construction of every sewer. They also should show distances to manholes, tees, wyes, connecting sewers, etc.

It is never too early or too late to start making records. Information gained now should be recorded so that it won't have to be duplicated in the future. Whenever a main is dug up, the depth, size, type, and location can easily be determined. The next time it is necessary to dig up that sewer, it won't be hard to find.

Records can be kept in many ways. Figure 9 shows one suggested method. One important suggestion is that there be more than one copy of the records, so that if one is lost it can be reproduced.

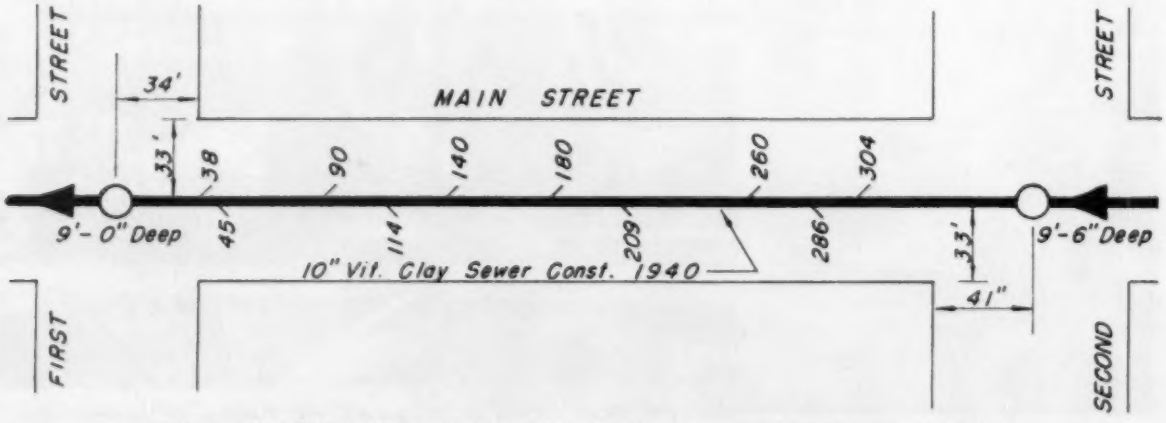


FIG. 9—SUGGESTED METHOD of recording location of manholes and Wyes and Tees.

By having plans all prepared, and qualifications established, Superior, Wisconsin was able to move fast when the money became available for its . . .

Primary Treatment Plant

by E. W. BERG, City Engineer, and R. W. McDANIEL, Superior, Wisconsin.

■ WHEN CONGRESS passed the Water Pollution Control Act in 1956, some communities had their plans prepared and were ready to apply for this new money for sewage construction. One of the first communities in the nation to qualify (receiving the maximum $250,000) was Superior, Wisconsin. This city is now constructing a primary treatment plant as part of a $1.5 million sewage improvement program.

Superior is located at the extreme southwest end of Lake Superior, from which it takes its name. Its waterfront is actually on St. Louis Bay, Bay of Superior, and the Bay of Allouez. These waters are protected from the open lake by two thin fingers of land known as Minnesota and Wisconsin Points. Two entries provide access to one of the leading tonnage ports in the country—the Duluth-Superior Port. An enormous quantity of iron ore is shipped from this port, also large quantities of grain and flour.

Present population of Superior is somewhat over 35,000. This figure has varied between 35,000 and 40,000 over the past 50 years. There is no evidence that a major increase should be expected.

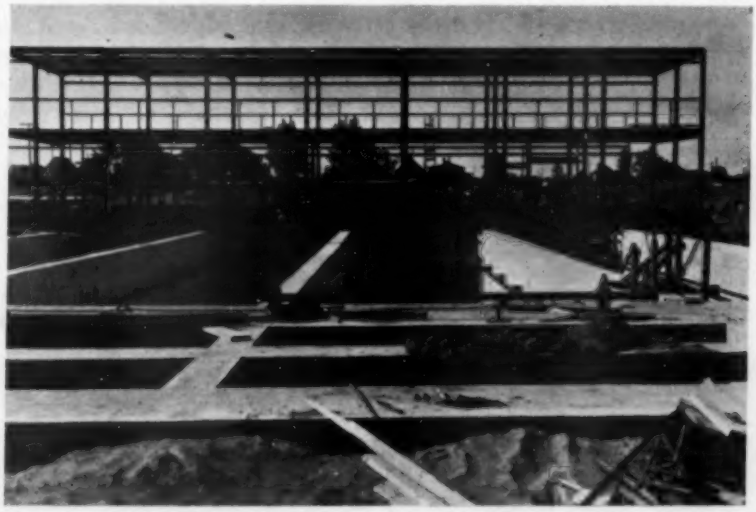
Initial Surveys

Before the enactment of the Federal Water Pollution Control Act, the Wisconsin State Board of Health made several surveys to determine the amount of pollution of the St. Louis River, which discharges into the bays. The objectionable conditions caused by the discharge of new sewage to the bays were found to be (1) bacterial pollution of the waters, (2) excessive sludge deposits near the sewer outfalls, and (3) serious depletion of dissolved oxygen when the bays are covered with ice.

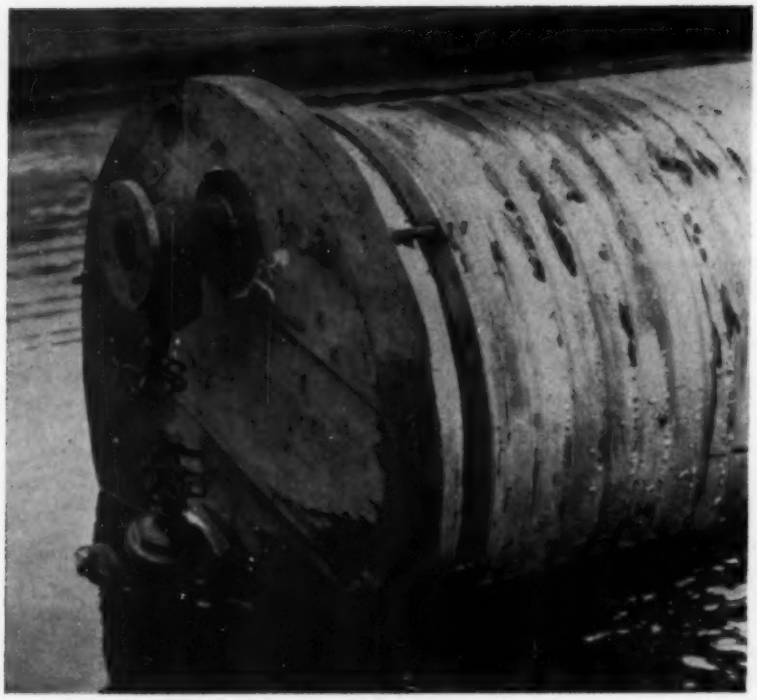
Based on these surveys, the state required the city of Superior to provide adequate sewage treatment facilities. The objectionable conditions could be corrected for the most part by providing treatment for the removal of virtually all the settling solids that form the sludge banks. In addition, this process of sedimentation will effect a reduction of biochemical oxygen demand, this being the factor that contributes to the serious reduction of dissolved oxygen in the bays when covered by ice. The provision of disinfection by chlorination will kill about 99 per cent of the sewage bacteria. Thus the three objectionable conditions of pollution could be remedied by primary treatment of Superior's sewage.

The sewer system in Superior is primarily a combined system that was constructed some years ago under the WPA program. Included were seven structures for lift stations. These were not equipped at the time, but will be completely furnished for operation under the new program. Each station will have pumping equipment and a weir arrangement to let storm water at maximum flow to separate and go directly into an outfall. A new collecting line is being installed to bring the sewage from the seven pumping stations to the plant site.

The sewage has no unusual characteristics. Quantity of industrial wastes is relatively small and causes no problem to normal sewage treatment and sludge disposal. The plant was designed to handle an average sewage flow of 5.0 million gallons a day. This is based on an average of 100 gallons per day per capita for 50,000 popula-



SEDIMENTATION TANKS in foreground with framing of administration building in the background.



CLOSE-UP of bulkhead used to float pipe into position. Note valves used for sinking the pipe.

tion. It is customary to provide treatment for sewage flow up to rates of 3 times the dry weather flow. Therefore, this plant was designed to handle a maximum flow of 15 million gallons a day.

Until 1955 the site for the sewage treatment plant was under water in Superior Bay. During 1955 it had been used for spoil area for materials dredged from the ship channel. Recovery of the land in this way brought substantial savings to the city.

Plant Operations

In general, the treatment plant consists of mechanically cleaned bar racks, an aerated grit chamber featuring a short detention period, and a flushing action for grit removal, a pump house, sedimentation tanks affording a detention period of more than 2½ hours at 5 mgd flow, two chlorine solution feed machines, two sludge digesters, a sludge elutriation tank, and an adequate plant administration and laboratory building. The digested sludge is dewatered on vacuum filters after conditioning with ferric chloride.

When the incoming sewage passes the bar screens, a 250-foot long, 60 in. overflow line into the bay is provided to allow the sewage to by-pass the plant during periods of excessive flow.

Outfall Line

Another outfall sewer was needed for discharging the plant effluent from the sedimentation tanks to a point in Superior Bay where water is 12 feet above the pipe. This required a 1400-foot long line more than half of which was floated into place and sunk. To do this the contractor assembled three 300-foot long sections of 36-inch diameter sewer pipe on land. In order to float the pipe while pushing it into position a watertight bulk-head was fitted to each end of the 300-foot long sections. The first section was floated out while the second was rolled into a shallow channel dug in the sand fill. A working raft was provided so that the two lengths of pipe could be joined above water. Land bound cranes were used to handle the pipe. The first two sections were pushed out and the process was repeated for connecting the third section.

After the three sections were coupled together, valves located in the end bulkheads were opened and water filled the pipe, sinking it into place. Sand bag ballasting was placed on the pipe to secure it and protect it from movement that might be caused by wave action from boats passing in the near-by ship channel.

Original plans for the treatment plant were prepared in 1948 by Hitchcock and Estabrook, consulting engineers of Minneapolis, Minnesota. Because of the delays until actual construction began, the plans were reviewed by Metcalf and Eddy of Boston, and certain improvements in the science of sewage treatment were incorporated.

Construction began in 1957 and the plant is expected to be in operation in 1958. General contractor for the job is Steenberg Construction Company of St. Paul; Pete Jensen is the superintendent. The outfall sewer was installed by Zenith Dredge Company of Duluth, Minnesota, which also performed the dredging operations preparatory to sinking the pipe.

300-ft. SECTION ready to be floated into position.

For the 31st annual meeting, to be held in Detroit, Mich., on Oct. 6-9, inclusive, there has been planned a full . . .

FSIWA Technical Program

The following program has been released by the office of Dr. Ralph E. Fuhrman, Exec. Secy., FSIWA; some minor changes may appear in the final program.

Monday, October 6

(1) Opening Session
Presiding—Kenneth S. Watson, President of the Federation
A.P.O.—L. F. Oeming

10:15 a.m. Call to Order—Kenneth S. Watson
Invocation—Dr. Robert M. Frehse, Director—Detroit Round Table of Catholics, Jews and Protestants

10:20 a.m. Address of Welcome—Hon. Lewis C. Mariano, Mayor of Detroit

10:45 a.m. "International Joint Commision Activities"
Hon. Douglas S. McKay, Chairman, U.S. Section, International Joint Commission, Washington, D.C.

11:30 a.m. "Ontario Moves Ahead on Water Resources Programming"
Dr. A. E. Berry, General Manager, Ontario Water Resources Commission, Toronto, Ont.

12:15 p.m. Adjourn

(2) Afternoon Session
Presiding—Dr. W. D. Hatfield, Vice-President of the Federation
A.P.O.—C. S. Anderson

2:00 p.m. "Effect of Impoundment on Dissolved Oxygen Resources in Stream"
F. W. Kittrell, In Charge, Stream Sanitation Studies, Water Pollution Control, WS & WP Program, USPHS Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio

2:15 p.m. Discussion
S. Leary Jones, Director, Stream Pollution Control, Tennessee Department of Public Health, Nashville, Tenn.

2:40 p.m. Discussion
Dr. Robert S. Ingols, Head, Department of Public Health, Georgia Institute of Technology, Atlanta, Ga.

3:00 p.m. "Comments on ASCE-FSIWA Manual of Sewage Treatment Plant Design"
Daniel A. Okun, Head, Department of Sanitary Engineering, University of North Carolina, Chapel Hill, N. Car.

3:15 p.m. "Design and Operation of Activated Sludge Plant in Edmonton, Alberta"
Norman McDonald, President, Gore and Storrie, Consulting Engineers, Toronto, Ont.

4:30 p.m. "Compulsory Licensing of Operators"
Donald M. Pierce, Chief, Section of Sewerage and Sewage Treatment, Division of Engineering, Michigan Department of Health, Lansing, Mich.

4:50 p.m. "Voluntary Licensing of Operators"
Don W. Jones, Supt., Water and Sewers, North Miami, Fla.

Tuesday, October 7

(3) Morning Session—A
Presiding—John S. Bethel, Partner, Metcalf and Eddy, Boston, Massachusetts
A.P.O.—D. F. Smallhorst
"SYMPOSIUM ON HOW TO REDUCE COSTS OF SEWAGE TREATMENT PLANT DESIGN, CONSTRUCTION AND OPERATION"

9:00 a.m. "Reduction of Sewage Treatment Costs by Use of Advanced Practice in Activated Sludge and Sludge Digestion"
Richard H. Gould, Consulting Engineer, Douglaston, N. Y.

9:45 a.m. "How to Reduce Sewage Plant Construction Costs"
A. W. Sawyer, Partner, Hazen and Sawyer, Consulting Engineers, New York, N. Y.

10:30 a.m. "How to Reduce Costs of Sewage Treatment Plant Operation"
E. J. Beatty, Engineer-Manager, Champaign-Urbana Sanitary District, Urbana, Ill.

11:15 a.m. "How Far Can We Go?"
Walter W. Saxton, Asso. Eng., Washington State Pollution Control Commission, Olympia, Wash.

(4) Morning Session—B
Presiding—L. F. Oeming, Michigan Stream Control Comm.
A.P.O.—C. S. Anderson
"SYMPOSIUM ON SYNDETS"

9:00 a.m. "Removal of ABS by Sewage Treatment Processes"
P. H. McGauhey and *S. A. Klein,* Dept. of San. Engr., University of California, Berkley, Calif.

9:35 a.m. "Evaluation of Frothing in Sewage Treatment"
L. B. Polkowski, G. A. Rohlich, and *J. R. Simpson,* University of Wisconsin, Madison, Wis.

10:10 a.m. "Biochemistry of ABS Metabolism"
Ross E. McKinney and *James M. Symons,* Mass. Inst. Tech., Cambridge, Mass.

10:45 a.m. "Condensed Phosphates in Natural Waters"
R. Englebrecht and *Jas. J. Morgan,* Univ. of Illinois, Urbana, Ill.

11:20 a.m. "Absorption of ABS by Inorganic Fines"
Charles E. Renn and *Mary F. Borada,* Johns Hopkins Univ., Baltimore, Md.

(5) Annual Federation Luncheon
Presiding—Kenneth S. Watson, President of the Federation

12:15 p.m. Invocation—Rev. R. E. Piper, Rector, St. Matthias Episcopal Church, Detroit, Michigan

1:15 p.m. "The Enrico Fermi Atomic Power Plant"
Robert W. Hartwell, General Manager, Power Reactor Development Co., Detroit, Mich.

(6) Inspection Trip—A
2:15 p.m. Detroit Sewage Works

(7) Inspection Trip—B
2:15 p.m. Ford Motor Company Trip to
(a) Steel rolling mill waste treatment at Rouge Plant, Dearborn, Michigan
(b) Combined water supply and electroplating waste treatment at Parts and Equipment Manufacturing Division, Monroe, Michigan
(c) Automotive exhibits at Ford Rotunda, Dearborn, Michigan

Wednesday, October 8

(8) Breakfast Session
Presiding—Dr. Gail P. Edwards, Professor of Sanitary Chemistry, New York University

7:30 a.m. Laboratory Scientists' Breakfast
Topic for Discussion—"Toxicity Determinations"

(9) Morning Session—A
Presiding—F. W. Gilcreas, Univ. of Florida
A.P.O.—E. A. Pearson

8:45 a.m. Motion Picture—"Engineering Your Health"—A USPHS Film

9:00 a.m. "Sewer Maintenance Panel"
Leader—Sydney A. Preen, Supt., Sewer Maintenance, Long Beach, Calif.
Participating — Grant Olewiler, Supt., Sanitary Drainage, Lower Merion Township, Ardmore, Pa.; *M. B. Nixon,* Engineer, Sewage Treatment, Atlanta, Ga.; *John Klamm,* Supt., Sewer Maintenance, Kansas City, Mo.

10:20 a.m. "Plant Maintenance Panel"
Leader—John C. Sager, Engineer of Maintenance & Design, Minneapolis, St. Paul Sanitary District, St. Paul, Minn.
Participating — Fred H. Burley, Supt., Sewage Treatment Works, Detroit, Mich.; *Clifford Irving,* Supt., Bureau of Sewage Treatment, Schenectady, N. Y.; *Arthur D. Caster,* Sewage Disposal Engineer, Cincinnati, Ohio

(10) Morning Session—B
Presiding—Dr. Ray W. Hess, Chairman, Industrial Wastes Committee
A.P.O.—H. S. Kline
SYMPOSIUM ON INDUSTRY MUNICIPALATY COOPERATION

9:00 a.m. "Unusual Industrial and Municipal Cooperation for Joint Treatment of Wastes—The American Cyanamid Company and the Somerset-Raritan Valley Sewage Authority"
Part I—"Industry's Approach and Position"
S. T. Powell, Consulting Chemical Engineer, Baltimore, Md., and *Dr. James C. Lamb III,* Sanitary Engineer, American Cyanamid Co., Bound Brook, N. J.
Part II—"Municipality Approach and Position"
Roy H. Ritter, Partner, Whitman & Requardt, Consulting Engineers, Baltimore, Md.

10:00 a.m. "The Amarillo Sewage Plant Effluent as a Source of Water Supply for the Texas Company"
Clarence Sherer, Supt., Sewage Treatment and Water Reclamation, Amarillo, Tex., and *Dean Alexander,* Engineer, Texas Co., Amarillo, Tex.

10:40 a.m. "Treatment of Metal Processing Wastes at General Electric's Conneaut, Ohio, Plant"
O. W. Nyquist, Plant Engineer, and *H. R. Carroll,* Chemical Engineer

11:20 a.m. "Tidewater's Delaware Refinery Waste Control and Treatment"
A. W. Lewis, Director, Refinery Technology, Tide Water Oil Company, and *A. J. Kaplovsky,* Delaware Water Pollution Commission

(11) Industrial Wastes Luncheon
Presiding—Dr. W. D. Hatfield, Vice-President of the Federation
12:15 p.m. Invocation—Rabbi Morris Adler, Shaarey Zedek, Detroit, Mich.
1:15 p.m. "Water Resources and Industrial Management"
Dr. W. H. Schuette, Gen. Mgr., Midland Division, Dow Chemical Co.

(12) Afternoon Session—A
Presiding—Dr. George E. Symons, Chairman, Publications and Program Committee

2:00 p.m. "Treatment of Industrial Wastes from Automotive Plants'
(1) *David Milne,* Supervisor, Materials & Processes, General Motors Production Engineering Section, Detroit, Mich.
(2) *A. R. Balden,* Staff Engineer, Chemical Engineering Department, Chrysler Motor Corporation, Detroit, Mich.
(3) *F. J. Kallin,* Chief Civil Engineer, Engineering and Planning Department, Ford Motor Company, Dearborn, Mich.

3:30 p.m. "Composting Industrial Waste Sludge"
A. J. Gabbaccia, Lederle Laboratories Division, American Cyanamid Co., Pearl River, N. Y.

4:15 p.m. "General Electric's Approach for Waste Control in the Private Atomic Power Industry"
James M. Smith, Jr., Radiological Engineer, General Electric Co., San Jose, Calif.

(13) Afternoon Session—B
Presiding—Dr. C. Fred Gurnham, Head, Department of Chemical Engineering, Michigan State University, Lansing, Michigan
A.P.O.—P. D. Haney
RESEARCH SYMPOSIUM

2:00 p.m. "Metabolic Energy Balances in a Total Oxidation Activated Sludge System"
R. Rupert Kountz, Professor of Sanitary Engineering, and *Charles Forney, Jr.,* Instructor in Civil Engineering, Penn State University, University Park, Pa.

2:45 p.m. "Investigation of Fundamental Principles of Trickling Filters"
Don E. Bloodgood, Prof. of San. Eng., *G. H. Teletzke,* Assoc. Prof. of San. Eng., and *F. G. Pohland,* Graduate Student, Purdue University, Lafayette, Ind.

3:30 p.m. "The Anaerobic Process as Applied to Sewage and Industrial Wastes"
George J. Schroepfer, Prof. of San. Eng., and *N. R. Ziemke,* Res. Fellow, University of Minnesota, Minneapolis, Minn.

4:15 p.m. "Determination of Toxic Organic Substances in the Aquatic Environment: I. Organo Phosphorus Insectides"
Charles M. Weiss, Associate Professor of Sanitary Science, University of North Carolina, Chapel Hill, North Carolina

(14) Annual Federation Banquet
Presiding—Kenneth S. Watson, President of the Federation
7:00 p.m. Invocation—Right Rev. Msgr. Edward J. Hickey, P.A., Ph.D., Pastor of St. Mary's of the Redford Parish, Detroit, Michigan
8:15 p.m. Awards

Thursday, October 9

(15) Morning Session—A
Presiding—D. P. Backmeyer, Supt., Sewage Treatment Works, Miami, Florida
A.P.O.—David B. Lee
OPERATORS FORUM

9:00 a.m. 1. "Control of Digester Scum, Gas Circulation and Mechanical Mixing"
Hugh A. Schreiber, Superintendent, Sewage Treatment Plant, Washington, D.C.
2. "Grease and Skimmings Removal, Handling and Disposal"
Roger D. Lee, Sewage Treatment Division, Wichita, Kan.
3. "Operators Certification, Voluntary and Compulsory"
Thomas T. Hay, Superintendent, Sewage Treatment, Racine, Wis.

(16) Morning Session—B
Presiding—Thomas C. Powers, Superintendent, Waste Disposal Division, Dow Chemical Company, Midland, Mich.
A.P.O.—L. L. Hedgepeth
INDUSTRIAL WASTE SYMPOSIUM—THE PETRO CHEMICAL INDUSTRY

9:00 a.m. *Part I*—Introduction by Chairman
9:05 a.m. "Basic Petrochemical Processes as Waste Sources"
W. L. Ruggles, Phillips Petroleum Co., Bartlesville, Okla.

9:30 a.m. "Secondary Petrochemical Processes as Waste Sources"
Dr. E. R. Wright, Texas Division, The Dow Chemical Co.

10:15 a.m. *Part II*—Petrochemical Wastes — The Character, Treatment and Ultimate Disposal
10:15 a.m. A. Alkaline Wastes
Alec McRae, Imperial Oil, Sarnia, Ont.
10:40 a.m. B. Condensates, Quenches and Wash Waters
Harold Elkin, Sun Oil, Philadelphia, Pa.
11:10 a.m. C. Tars, Spent Catalysts and Complexes
Jack T. Garrett, Monsanto Chemicals, St. Louis, Missouri
11:40 a.m. Summation
M. B. Ettinger, USPHS, Cincinnati, Ohio

The editor's comments

The Convention Season

The month of September always seems like the start of a new year to me—perhaps it seems so to many others. This feeling probably stems from long attendance in our schools and universities, where the academic year begins in September. In my case, this feeling also stems from the fact that most conventions of water and sewage associations and groups are held from September to May, although there are a few meetings in June and a couple in August. Just as the theater has its season and the schools their academic years, we in this field have our convention season, which begins this month.

What is there to look forward to on the convention circuit this year? There will be the annual meetings of NEWWA (Poland Spring, Me. this month), FSIWA (Detroit in October) and AWWA (San Francisco, next July). Then there are other national organizations which have annual meetings of divisions dealing with water and sewage treatment, such as ACS, APHA, APWA and ASCE. Also, there will be the industrial wastes conferences which deal with stream pollution abatement.

Add to these, 30 AWWA sections in this country which hold at least one meeting a year (some hold two) and 35 associations in the FSIWA, which hold annual meetings (some meet twice a year). Then there are the smaller sectional groups throughout the country, some affiliated with AWWA sections or FSIWA associations, some not. I can think of more than 25 that I have attended or had contact with; add to these, 25 or 30 water/and or sewage short schools each year. With no difficulty at all, it is possible to arrive at a grand total of 130 meetings a year (probably more).

For the average water or sewage works man or consulting engineer attendance at technical meetings presents few problems; he will attend one, two, or perhaps three national association meetings depending on his interests, and he will attend his local AWWA section or FSIWA association meetings and perhaps the local area meetings, maybe half a dozen meetings at the most each year.

For the editorial staff of this magazine, the problem is different and more complex. Their attendance at conventions is a matter of service to our readers, and the problem involves the selection of those meetings which should be and can be attended and reported within the budget available and the physical abilities of the staff to attend meetings and carry on their other editorial duties and functions.

Obviously, it is not possible to "cover" all of the meetings every year. From a practical standpoint it is possible to cover only about one-fifth of the total meetings each year. These questions arise: Which fifth? Should coverage be rotated among all meetings? Should some meetings never, or hardly ever, be "covered"? Do our readers like reports on meetings? If so, how many? Which ones do they consider most important? How broad should the reports be?

For the coming season, a schedule has been drawn based on a rotation system over the next few years. Meanwhile, opinions and thoughts of our readers are desired; your comments will be welcome.

AWWA "Do It Now" Effective

At the Dallas meeting in April, AWWA officers spoke out for a "Do It Now" campaign aimed at helping to counteract the slowdown in the nation's economy, as well as improving water works service. By mid-July the effect of this campaign was evident. A survey of 180 communities serving 15 per cent of the U. S. population indicated that 54 per cent were speeding up 1958 projects and 23 per cent were moving up 1959 projects to this year. This represents a speed-up of $59,000,000 worth of construction or a 20 per cent increase for 1958 over 1957. At this rate, spending this year for water works projects may reach $750 million (it was $560 million last year).

Data from security and bond houses bear out this trend toward increased spending in 1958—state and municipal long-term financing totaled a record $4.4 billion in the first half of 1958; that's 27 per cent more than in the first half of 1957.

The Federation Program

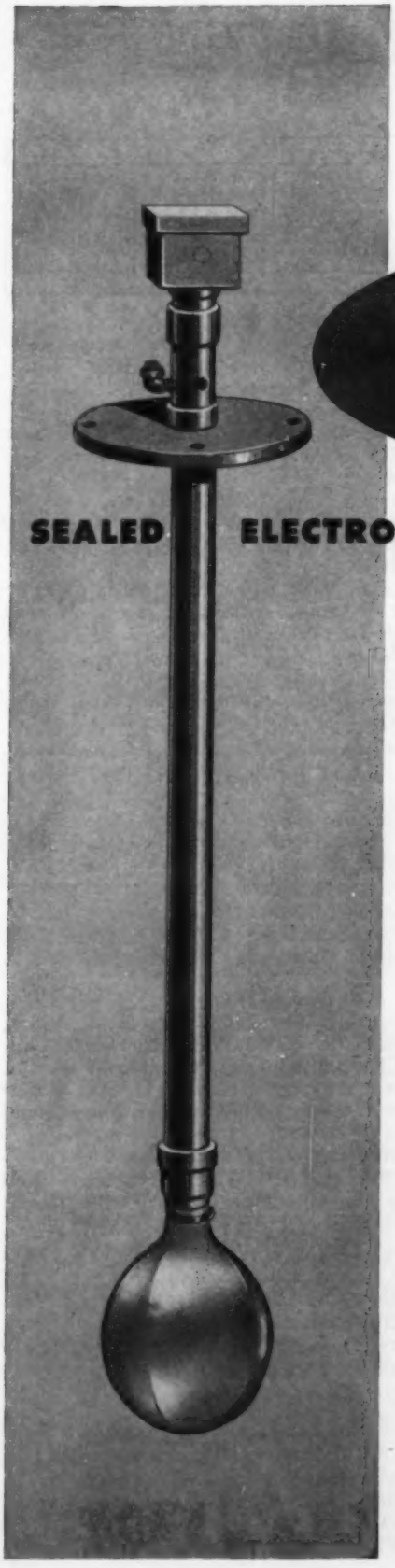
Elsewhere in this issue, there appears the complete program for the 31st annual meeting of the FSIWA to be held next month in Detroit. Both in number of papers to be presented and number of sessions to be held, as well as total hours devoted to technical papers, this program is the largest in the history of the Federation.

The opening session will be addressed by the Hon. Douglas S. McKay, Chairman, U. S. Section, International Joint Commission on Boundary Waters. Other speakers of note also will deal with topics of special interest to Federation members.

Counting all activities, there will be sixteen sessions this year during the three and a half day meeting. There are ten sessions at which technical papers will be presented; three of these deal with industrial waste (heretofore there have been two); three are symposia on (a) Research (b) Costs of Sewage Treatment and (c) Syndets. In addition, there are two scheduled luncheons and one breakfast (all with technical speakers).

Because of the number of papers to be presented (45 in all) the program requires concurrent sessions for five session periods (and concurrent inspection trips).

Last year the Board of Control of the Federation considered this matter of expanding the program of the annual meeting. The general feeling was in favor of more concurrent sessions rather than adding a session on Thursday afternoon. From the program for 1958, it appears that the limit of concurrent sessions has almost been reached; any further increase in program size will require all periods to have concurrent sessions (except the opening session) or the elimination of the inspection trips, or a full four-day meeting.



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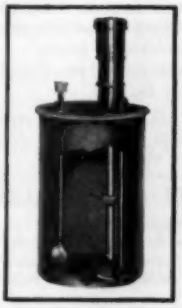

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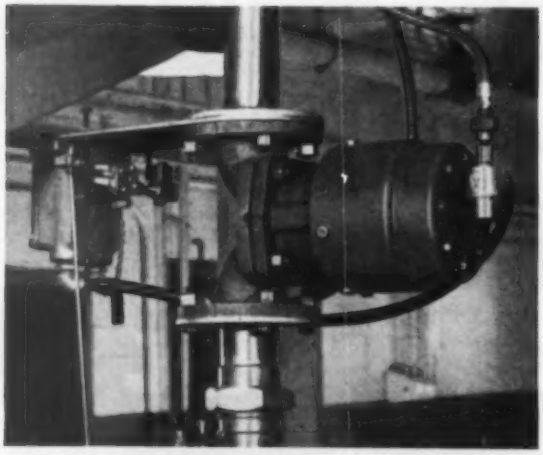

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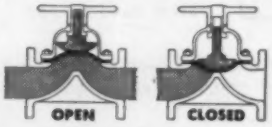
The operating principle of the valve is simple. The resilient, flexible diaphragm lifts high when the compressor is raised — seals tight against the body weir when compressor is lowered. Closure is positive, even should grit, pipe scale or other solid matter be trapped on the weir.

Grinnell-Saunders Diaphragm Valves are unsurpassed for handling materials as diversified as corrosive fluids, gases, beverages, foods . . . in lines where corrosion, abrasion, contamination, clogging, leakage and maintenance are costly factors.

Grinnell valves are available with body, lining and diaphragm materials to meet different service conditions. Write for details.

FEATURES OF GRINNELL-SAUNDERS DIAPHRAGM VALVES:

- Diaphragm lifts high for streamline flow in either direction . . . completely isolates working mechanism from fluid stream.
- Resilient diaphragm assures positive closure.
- Body, lining and other diaphragm materials to suit service conditions.
- Simple maintenance. Diaphragm can be replaced easily without removing valve.

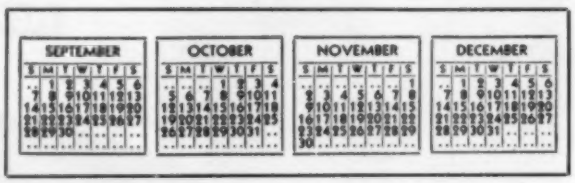


GRINNELL
WHENEVER PIPING IS INVOLVED

Executive Offices: Providence, R. I. Sales Offices and Warehouses in Principal Cities

Meetings

1958



Sept. 7-12—Chicago, Ill.
AMERICAN CHEMICAL SOCIETY, 134th National Meeting, Water, Sewage & Sanitation, Secy., H. B. Gustafson, P. O. Box 5033, Tucson, Ariz.

Sept. 8-10—Grand Rapids, Mich. *(Pantlind Hotel)*
MICHIGAN SECTION, A.W.W.A., Secy., T. L. Vander Valde, Chief, Michigan Dept. of Health, DeWitt Rd., Lansing 4, Mich.

Sept. 8-12—Raleigh, N. C. *(N. C. State College)*
SEWAGE & INDUSTRIAL WASTES OPERATORS SCHOOL, College Extension Division, N. C. State College, Box 5125, Raleigh, N. C.

Sept. 10-12—Lake Placid, N. Y. *(Lake Placid Club)*
NEW YORK SECTION, A.W.W.A., Secy., Kimball Blanchard, 19 West 50th St., New York 20, N. Y.

Sept. 10-12—Atlanta, Ga. *(Georgia Tech.)*
GEORGIA WATER & SEWAGE ASSN., Secy., A. T. Storey, Atlanta Water Works, 1210 Hemphill Ave. N.W., Atlanta 13, Ga.

Sept. 14-17—Poland Spring, Maine *(Poland Spring House)*
NEW ENGLAND WATER WORKS ASSOCIATION, Secy., Joseph C. Knox, N.E.W.W.A., 73 Tremont St., Boston 8, Mass.

Sept. 15-17—Denver, Colo. *(Cosmopolitan Hotel)*
ROCKY MOUNTAIN SECTION, A.W.W.A., Secy., V. A. Vaseen, Ripple & Howe, 426 Cooper Bldg., Denver 2, Colo.

(Jointly With)
ROCKY MOUNTAIN SEWAGE WORKS ASSN., Secy., Verne E. Plath, P. O. Box 149, Englewood, Colo.

Sept. 17-19—Cleveland, Ohio *(Statler Hotel)*
OHIO SECTION, A.W.W.A., Secy., J. H. Bass, Robert F. McGivern & Assoc., 1771 West Fifth Ave., Columbus 12, Ohio.

Sept. 17-19—Wausau, Wis. *(Hotel Wausau)*
WISCONSIN SECTION, A.W.W.A., Secy., Harry Breimeister, City Engineers Office, City Hall, Milwaukee 2.

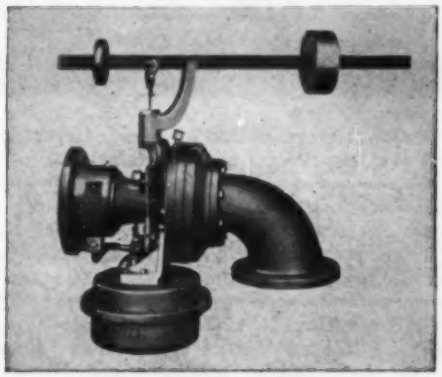
Sept. 17-19—Deadwood, S. D. *(Franklin Hotel)*
SOUTH DAKOTA WATER & SEWAGE WORKS CONF., Secy., Don C. Kalda, Pierre, S. D.

Sept. 22-24—Memphis, Tenn. *(Peabody Hotel)*
KENTUCKY-TENNESSEE SECTION, A.W.W.A., Secy. J. Wiley Finney, Jr., Howard K. Bell, Cons. Engrs., 553 So. Limestone St., Lexington, Ky.

(Jointly With)
KENTUCKY-TENNESSEE INDUSTRIAL WASTES & SEWAGE WORKS ASSN., Secy., S. Leary Jones, Cordell Hull Bldg., Nashville, Tenn.

Sept. 24-25—Stillwater, Okla. *(A & M College)*
OKLAHOMA INDUSTRIAL WASTES CONF., Secy., H. M. Crane, 3400 Northeastern, Oklahoma City 5, Okla.

SIMPLEX TYPE S RATE OF FLOW CONTROLLER
Direct venturi-actuated. Self-contained . . . operates when all power sources fail.



OVER 5,000 UNITS IN SERVICE PROVE SIMPLEX FILTER CONTROLLERS YOUR BEST VALUE!

Simplex economy and accuracy demonstrated by 25 years' dependability

Simplest way to make sure you're specifying the best: check some installations. Investigate all types and makes of filter controllers. Find out which give the best control . . . which the best balance of initial vs. operating and maintenance costs.

Include the *hidden extras* in total installed cost: space-wasting straight pipe runs before or after the unit; expensive electric or pneumatic positioners with additional circuits. You'll find that venturi-actuated Simplex controllers cut costs because they're completely self-contained . . . require no extras.

Dig into maintenance costs. You'll find direct-acting Simplex controllers give long years of trouble-free service. They're self-operating . . . need no positioners, have fewer moving parts, virtually friction-free action.

Take a second look at performance. With Simplex you'll find low head loss that saves on pumping. And straight-line accuracy to the end point that makes for longer filter runs.

Simplex can help you save money on your next expansion or your new plant. Ask us to prove it!

MAIL THIS COUPON TODAY! ▶

SIMPLEX®
VALVE AND METER COMPANY
a subsidiary of PFAUDLER PERMUTIT INC.
Venturi Tubes • Flumes • Meters • Gauges
Transmitters • Controllers • Tables • Air Valves

SIMPLEX VALVE & METER CO., Dept WS-9, 7 East Orange St., Lancaster, Pa.

Send me new Technical Bulletin 900 that gives valuable design and performance data on Filter Controllers and Master Control Systems.

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CJC LUBE OIL FILTERS RAISED SOME EYEBROWS AT HUNTS POINT!

- **3000 hours continuous operation before first cleaning.**
- **Annual savings over $735 per engine in cleaning and filter replacement costs.**
- **Plant-wide lube oil savings of 100 gallons per month.**

These dramatic savings resulted from installation of CJC Filters at New York City's Hunts Point Pollution Control Plant.

Write for folder on "The Hunts Point Story." Learn how CJC Filters can give you 100% sludge retention, 100% removal of solid impurities, lower neutralization number, many other benefits!

Norse Electric
MANUFACTURING CO., INC.
55 Water Street, New York 4, N. Y.
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ALUMINUM WALKWAYS ARE SAFE, MAINTENANCE-FREE

Non-Corrosive, Strong and Durable—They are Valuable Assets in Water and Sewage Plants

George H. Hill, Washington Aluminum's New England representative, points out the grating's patented non-directional, non-skid safety feature.

Washington Aluminum Walkways ***provide*** a lifetime of maintenance-free service—never need painting, resist rust and corrosion, provide ventilation. Their strength lies in the I beam extrusion.

Washington Aluminum fabricates grating and other installations to specification. Washington Aluminum Engineers are available for discussion of design problems on any installation at point of planning. No obligation. **Write for nearest representative.**

WASHINGTON ALUMINUM COMPANY, Inc.
Dept. 79 • Baltimore 29, Md. • Phone Circle 2-1000

Sept. 24-26—Duluth, Minn. *(Hotel Duluth)*
NORTH CENTRAL SECTION, A.W.W.A., Secy., L. N. Thompson, Gen. Mgr., Water Dept., St. Paul 2, Minn.

Sept. 25-27—Spokane, Wash. *(Davenport Hotel)*
PACIFIC NORTHWEST SEWAGE & INDUSTRIAL WASTES ASSN., Secy., G. H. Dunstan, Box 176, Pullman, Wash.

Sept. 28-30—Jefferson City, Mo. *(Hotel Governor)*
MISSOURI SECTION, A.W.W.A. AND MISSOURI WATER & SEWERAGE-CONFERENCE, Joint Meeting, Secy., Warren A. Kramer, State Office Bldg., 6th Floor, Jefferson City, Mo.

Sept. 28-Oct. 1—Biloxi, Miss. *(Buena Vista Hotel)*
ALABAMA-MISSISSIPPI SECTION, A.W.W.A., Secy., C. M. Mathews, Gen. Mgr., Greenwood Utility, Greenwood, Miss.

Oct. 1-3—Dickinson, N. D. *(Ray Hotel)*
NORTH DAKOTA SEWAGE & INDUSTRIAL WASTES ASSN., Secy., Jerome H. Svore, c/o State Dept. of Health, Bismarck, N. D.

Oct. 1-3—Fredericton, New Brunswick *(Lord Beaverbrook Hotel)*
CANADIAN SECTION, Maritime Branch, Secy., J. D. Kline, Asst. Mgr. & Ch. Engr., 162 Lady Hammond Rd., Halifax, N. S.

Oct. 5-9—Detroit, Mich. *(Sheraton-Cadillac Hotel)*
FEDERATION OF SEWAGE & INDUSTRIAL WASTES ASSN., Ralph E. Fuhrmann, Exec. Secy., 4435 Wisconsin Ave., N.W., Washington 16, D. C.

October 8-10—Dickinson, N. D. *(Ray Hotel)*
NORTH DAKOTA WATER & SEWAGE WORKS CONFERENCE, Secy., W. Van Heuvelen, Bismarck, N. D.

Oct. 9—Bingham, Maine
MAINE WATER UTILITIES ASSN., Secy., Gerard F. Laurin, 89 Western Ave., Augusta, Maine

Oct.13-17—New York, N. Y. *(Hotel Statler)*
AMERICAN SOCIETY OF CIVIL ENGINEERS, W. H. Wisely, Exec. Secy., 33 W. 39th St., New York 18, N. Y.

Oct. 14-17—Atlantic City, N. J. *(Chalfonte Hotel)*
PENNSYLVANIA WATER WORKS ASSN., Secy., David Dunlap, 2609 N. Second Street, Harrisburg, Pa.

Oct. 15-17—Des Moines, Ia. *(Hotel Fort Des Moines)*
IOWA SECTION, A.W.W.A., Secy., J. J. Hail, Supt., Water Dept., City Hall, Dubuque, Ia.

Oct. 19-22—Quebec City, Prov. Quebec *(Chateau Laurier)*
CANADIAN INSTITUTE ON SEWAGE & SANITATION, Dr. A. E. Berry, Administrative Office, 72 Grenville St., Toronto 8, Can.

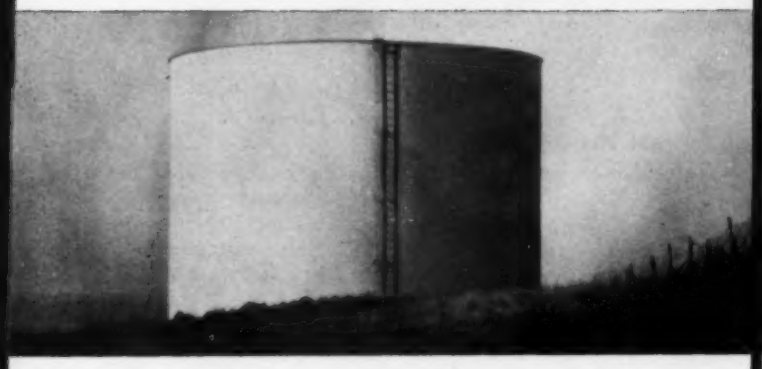
Oct. 19-22—No. Miami Beach, Fla. *(Golden Gate Hotel)*
FLORIDA SECTION, A.W.W.A., Secy., John G. Simmons, Supt., Water Dept., Box 1311, West Palm Beach, Fla.

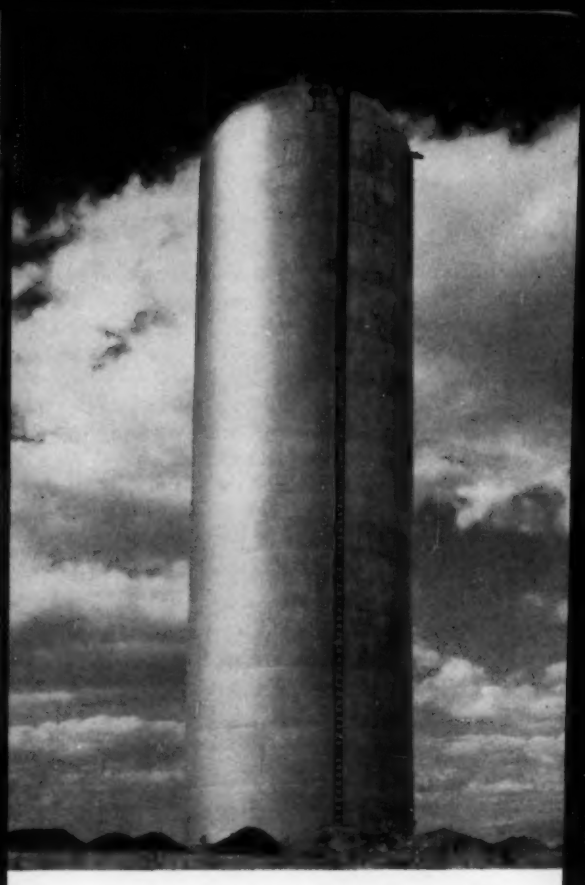
(Jointly With)

FLORIDA SEWAGE & INDUSTRIAL WASTES ASSN., Secy., Ralph H. Baker, Jr., State Board of Health, P. O. Box 210, Jacksonville 1, Fla.

Oct. 22-23—Charleston, W. Va. *(Daniel Boone Hotel)*
WEST VIRGINIA SEWAGE & INDUSTRIAL WASTES ASSN., Secy., Glen O. Fortney, State Dept. of Health, Charleston 5, W. Va.

Oct. 23-24—Charleston, W. Va. *(Daniel Boone Hotel)*
WEST VIRGINIA SECTION, A.W.W.A., Secy., Hugh W. Hetzer, Union Carbide Chemicals Co., Div. Union Carbide Corp., P. O. Box 8361, So. Charleston 3, W. Va.



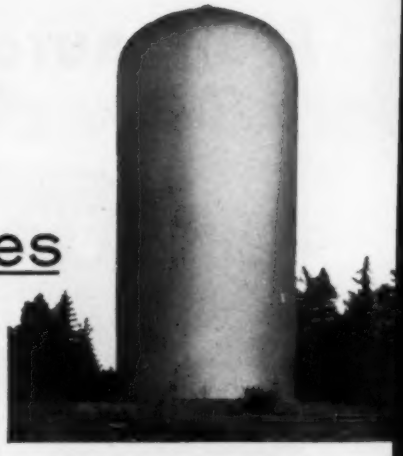


for greatest economy in water storage
you need the advantages of site
plus

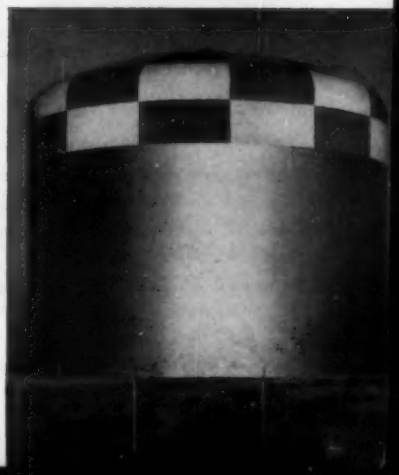
reservoirs and standpipes

by

Pittsburgh-Des Moines



The combination of adequate site elevation and Steel Reservoirs or Standpipes can assure rockbottom water storage costs for many communities. PDM steel water storage units are strong, permanently watertight, low in maintenance, and are guaranteed in design, workmanship and materials. Let us quote on your water storage requirements from 50,000 to 5,000,000 gallons and up. Write for descriptive bulletin.



Pittsburgh-Des Moines Steel Company

Plants at: PITTSBURGH, BALTIMORE, DES MOINES, SANTA CLARA, FRESNO, and STOCKTON, CALIF.

Sales Offices at:

PITTSBURGH (25) ..... 3418 Neville Island
NEWARK (2) ..... 1718 Military Park Bldg.
CHICAGO (3) ..... 622 First National Bank Bldg.
EL MONTE, CAL. ..... P. O. Box 2012
DES MOINES (8) ..... 919 Tuttle Street
DALLAS (1) ..... 1223 Praetorian Building
SEATTLE (1) ..... Suite 526, 500 Wall Street
SANTA CLARA, CAL. ..... 625 Alviso Road
DENVER (2) ..... 323 Railway Exchange Bldg.
BALTIMORE (26) ..... Curtis Bay Station

PDM
RESERVOIRS

New Bulletins

CONTINUED FROM PAGE 53A

scriptive information, charts and data, new tables for the evaluation of flow friction that will greatly simplify planning and design under most conceivable conditions.

The booklet, while it points out the advantages of Bethlehem's special copper bearing steel, also calls attention to the many advantages of corrugated sheet steel over more rigid materials in the manufacture and installation of drainage culverts, such as long life, ease of fabrication and handling, low relative cost, and other important factors.

Accessory Equipment For Dissolved Oxygen Analyzer

940

Beckman Process Instruments Div., Fullerton, Calif., has available Specification Sheets on accessory equipment for use with the Beckman Model 70 Dissolved Oxygen Analyzer.

Specification Sheet 0-4111 describes the Automatic Multi-Sample System which selects, identifies, and channels up to four sample streams for analysis by one Model 70. The bulletin includes features, system photographs, and mounting dimension diagrams of system components.

Specification Sheet 0-4112 describes the Sample Pressure Regulator, Sample Cooler with Thermal Switch, Calibrator, and Mounting Accessories. The bulletin includes descriptions of components, specifications, photographs, and mounting dimension diagrams.

Eleventh Annual Dresser-Coupled Water Lines Report

941

Dresser Mfg. Div., One of the Dresser Industries, Inc., Bradford, Pa., has just published its Eleventh Annual Water Lines Report for the year 1957.

This 12-page report titled "Dresser-Coupled Steel Water Lines—A Report for the Year 1957" covers construction details on principal steel water lines installed during the past year. Water lines varying in diameter from 4" to 54" are accounted for along with penstock construction. Water lines from all over the United States and South America are represented.

This new report is well-illustrated with on-the-job photographs taken at the sites of construction. Included also are completed case histories of field installations of Dresser's new Style 200 "Aquapak" self sealing coupling for underground water lines.

Field Erected Steel Storage Tanks

942

Fisher Tank Co., Chester, Pa., has available an 8-page, 2-color booklet that describes the Fisher all-welded, field erected steel storage tanks.

The booklet provides information on the background and policies of the company, along with a description of the plant and its facilities.

FULL AUTOMATIC
Engine Controls

Model 1436M4

SYNCHRO-START Engine Controls provide automatic start and stop from any type of remote pilot switch. Interrupted cranking periods with total time limit of cranking is a regular feature.

Standard Controls are available which provide FULL PROTECTION for the engine. The model shown will light an individual signal and operate an external alarm in event the engine fails to start. Should low oil pressure, high water temperature, and overspeeding occur while running, the engine will stop and Visual Signal will indicate source of trouble.

Additional safety features can be incorporated on special order.

These controls can be used with Diesel, Gasoline, and Gas engines.

Request Bulletin 501

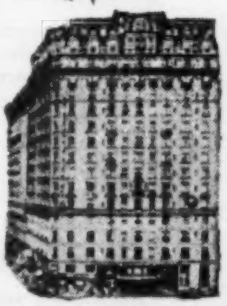
Synchro-Start Products Inc.

8151 N. RIDGEWAY AVE. • SKOKIE, ILL.

THE Martinique

THE NEW LOOK IN NEW YORK

Sparkling new interiors—superb new furnishings—striking new decor! Ideally located in the great Penn Zone Times Square, Radio City, Rockefeller Plaza, theater district, and famous Fifth Avenue shops less than 5 minutes away. Lobby connects with Penn Railroad and Greyhound Bus terminals, and Hudson-Manhattan Tubes to Jersey. 650 luxurious rooms—radio, television, air-conditioning available. All hotel services.



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from $5 single $8.50 double

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CONVENTION FACILITIES

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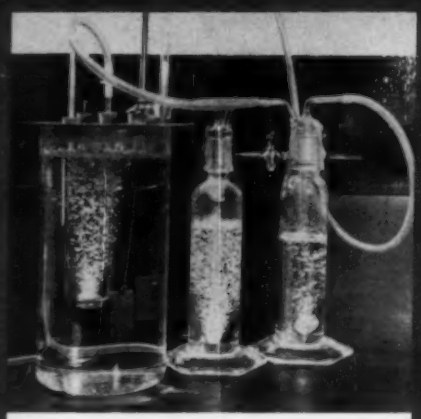
NEW MARTINIQUE LOUNGE COFFEE SHOP

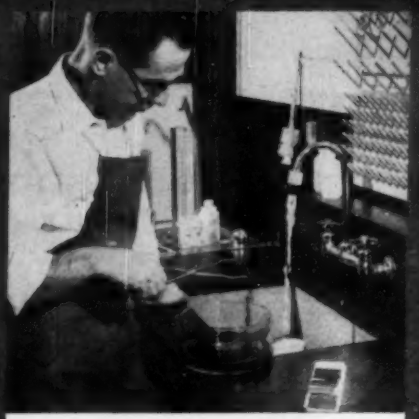
BROADWAY AT 32nd STREET New York City

Telephone PEnnsylvania 6-3800

1 Analytical weighing of specimens prior to testing



2 Steam condensate corrosion test



3 Cleaning specimens with inhibited hydrochloric acid

4 Second analytical weighing to determine corrosion weight loss

5 Calculation and statistical analysis of laboratory test results

6 Final examination of specimens under low power magnification

Extensive testing program proves new 4-D Wrought Iron more corrosion-resistant than ferrous substitutes

Test results from the Byers Research Laboratory lend documentary support to the superiority of new 4-D Wrought Iron—over standard Wrought Iron as well as ferrous substitutes.

Convincing case-history service records are now further substantiated by the conclusive findings of our metallurgical staff. Some typical results of this testing program are presented in the chart at right.

The Byers field service representative will be pleased to relate these test results to your corrosive applications. Write us for helpful literature on new 4-D Wrought Iron. A. M. Byers Company, Clark Building, Pittsburgh 22, Pennsylvania.

BYERS WROUGHT IRON

Comparative Analysis of 4-D Wrought Iron Corrosion Tests

Tests	4-D Wrought Iron	Standard Wrought Iron	Ferrous Substitutes
Severe industrial atmospheric continued exposure 17 years	Corrosion weight loss 540 grams/sq. ft.	Corrosion weight loss 655 grams/sq. ft.	Not included in test
Steam condensate return line	*At least 25% greater corrosion-resistance than standard Wrought Iron	No failures 10 years (still in service)	Complete failure after 2 years
Aerated salt water—5 weeks (Short term test—points indicate 4-D Wrought Iron curve flattening out at much lower rate of attack)	Corrosion weight loss 146 mg/sq. in.	Corrosion weight loss 170 mg/sq. in.	Corrosion wt. loss 226 mg/sq. in.
Brine piping	*At least 25% greater corrosion-resistance than standard Wrought Iron	No failures 23 years (still in service)	Complete failure after 7 years
Salt water, Gulf of Mexico ¼ inch plate—17 years	Corrosion weight loss 4 mills/years (minimum plate thickness now 3/16") Still in excellent condition	Not included in test	Corrosion weight loss 30 mills/years; plate badly pitted, perforated
Downspout	*At least 25% greater corrosion-resistance than standard Wrought Iron	No failures in 29 years (Still in service)	Complete failure after 18 years

*In this application no long term test data yet available on 4-D Wrought Iron. Results shown are derived from short term tests.

News of Suppliers

F & P Offers Lab. Facilities

Fischer & Porter Co., Hatboro, Pa., has announced the availability of the facilities of its modern fluids laboratory for the accurate calibration of flow measuring devices and for the determination of fluid properties such as density, viscosity, consistency and shear stress. Virtually any type of flow measuring device, including variable-area, orifice, turbine and obstructionless meters, can be calibrated. Tests simulating customers' conditions are accurate to 0.1%. Liquid calibrations can be made over flow ranges from a fraction of a pound an hour up to one million pounds an hour; gas calibrations can be made from a few cubic centimeters a minute up to 150 cubic feet a minute.

Rupprecht Joins Pennsalt

Pennsalt of Washington Div., Pennsalt Chemicals Corp., Tacoma, Wash., has announced the addition of Henry J. Rupprecht to Pennsalt's Industrial Chemical Sales Department.

Rupprecht, a native Oregonian recently released from the U. S. Air Force, graduated from Oregon State College where he studied business administration and industrial chemistry.

Mr. Rupprecht will initially assist Pennsalt's Dean McCrory of Industrial Chemical Sales in the rapidly expanding Southern Washington-Oregon-Northern California territory.

Pierce Named Mgr. Pennsalt's Corrosion Eng. Products

Pennsalt Chemicals Corp., Philadelphia, Pa., has announced that Robert R. Pierce has been named Manager of the Corrosion Engineering Products Department. Pierce will be in charge of manufacturing, sales and development for the company's line of corrosion resistant mortars, protective coatings, plastic toppings, and plastics for the fabrication of process equipment used to handle corrosives. He will have headquarters in Natrona, Pa., where all activities for this department are centered.

Pierce, formerly in charge of sales for Pennsalt's corrosion engineering products, is a veteran of 17 years' experience in palnt, technical service and sales management with Pennsalt. A graduate of Oregon State College with a degree in chemical engineering, he has been sales manager for the Corrosion Engineering Department since 1951. In adidtion, he has served as Pennsalt's corrosion engineering consultant for its 19 chemicals manufacturing plants.

Hagan Acquires Kybernetes

Hagan Chemicals & Controls, Inc., Pittsburgh, Pa., has announced the acquisition of the name and tangible assets of The Kybernetes Corporation, New York City.

Kybernetes, formerly a subsidiary of Self Winding Clock Company, Inc., manufactures automatic data logging and temperature monitoring equipment for industry.

According to William W. Hopwood, Hagan president, production will continue at Kybernetes present plant but eventually will be transferred to Hagan's instruments and controls plant in Orrville, Ohio. Key sales and engineering personnel are already operating out of Hagan headquarters in Pittsburgh.

A-C Promotes Kucera To Manager, N. Y. District

Allis-Chalmers Industries, Group, Milwaukee, Wis., has announced the appointment of Clinton F. Kucera as manager of the New York district office.

Kucera had been assistant manager of the New York district office since 1957. Prior to that he had been regional representative for transmission equipment in the Southeastern Region and before that assistant sales manager in the company's switchgear department.

Kucera joined Allis-Chalmers in 1946. He is an electrical engineering graduate of Iowa State College and a member of the American Institute of Electrical Engineers. In his new post, Kucera succeeds N. W. Landis, recently named manager of Allis-Chalmers Northeast Region.

Clark Root Appointed President of Graver Tank

Graver Tank & Mfg. Co., East Chicago, Ind., has announced the appointment of W. Clark Root, a 48-year-old engineer to the position of President and chief executive officer of Graver Tank. It was also announced that Jalmer E. Swason, current president of Graver, has moved to the post of vice-chairman of the Board.

Root joined Graver Tank in April, 1958 as executive vice-president. Previously he was project manager for Canadian Bechtel, Ltd.

Root was graduated from the University of Illinois with a bachelor of science degree in civil engineering.

He began his career as an engineer with the Shell Oil Co. soon after graduation.

C.B.&I. Purchases Conkey

Chicago Bridge & Iron Co., Chicago, Ill., has announced the purchase of Conkey equipment, patents, applications, drawings, patterns and records from Henry Hunter and George Dickey of New York.

Evaporator, crystallizer and filter equipment previously sold by the CB&I Conkey Division, which has now been integrated with CB&I operations, will be designated hereafter as Chicago Bridge & Iron Company evaporators, crystallizers and filters.

James Mair, who has for the past two years been located in CB&I's Chicago Sales Office, has moved to New York to round out the new sales staff for CB&I processing equipment such as evaporators, crystallizers and filters.

Kuhn Heads Sales At Dresser

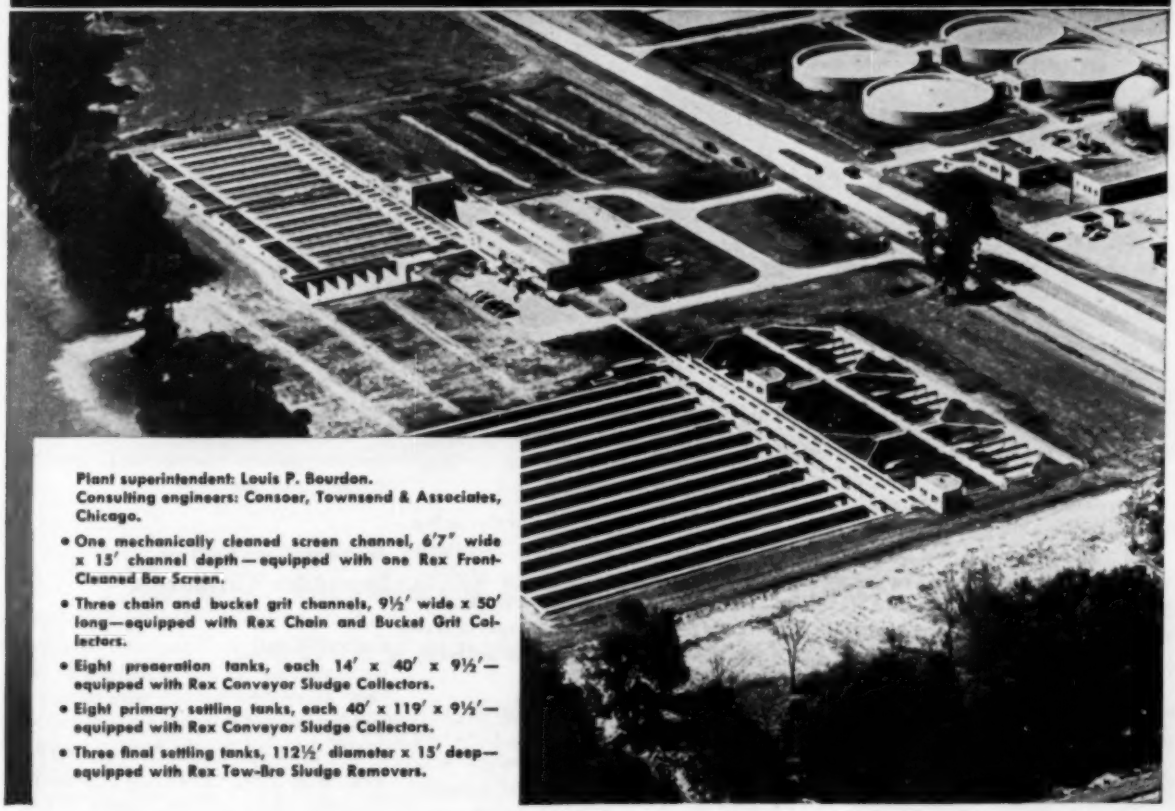
Dresser Manufacturing Div., one of the Dresser Industries, Inc., Bradford, Pa., has announced that Charles Kuhn, formerly Vice President in Charge of Sales for Hills-McCanna, Chicago, has been appointed Sales Manager, Regular Products.

Prior to his association with Hills-McCanna, he held a similar position with Fansteel Metallurgical Corporation, Chicago.

Mr. Kuhn assumes the position vacated by Mr. H. Z. Hight who is now President of Bonded Products, Inc.

SOUTH BEND SEWAGE TREATMENT PLANT...

Model of modern design



Plant superintendent: Louis P. Bourdon.
Consulting engineers: Consoer, Townsend & Associates, Chicago.

- One mechanically cleaned screen channel, 6'7" wide x 15' channel depth—equipped with one Rex Front-Cleaned Bar Screen.
- Three chain and bucket grit channels, 9½' wide x 50' long—equipped with Rex Chain and Bucket Grit Collectors.
- Eight preaeration tanks, each 14' x 40' x 9½'—equipped with Rex Conveyor Sludge Collectors.
- Eight primary settling tanks, each 40' x 119' x 9½'—equipped with Rex Conveyor Sludge Collectors.
- Three final settling tanks, 112½' diameter x 15' deep—equipped with Rex Tow-Bro Sludge Removers.

The South Bend, Indiana, sewage treatment plant is a model of modern plant design and operation. This plant, which recently went into operation, is designed to function both as a conventional activated sludge and a split activated sludge treatment plant. It processes an average daily flow of 48 m.g.d. Optimum flexibility in treatment and operation was designed into this plant which can partially treat a peak flow to 80 m.g.d. To assure translation of design efficiencies into actual performance...provide maximum operating economy, CHAIN Belt's modern waste treatment equipment was installed in both the primary and secondary treatment stages.

A Rex Front-Cleaned Bar Screen and Rex Grit Collectors provide effective removal of large and inorganic solids. Rex Conveyor Sludge Collectors in the preaeration and primary settling tanks assure efficient preliminary treatment, and positive sludge and scum removal. Rex Tow-Bro Sludge Removers in the final sedimentation tanks provide the positive, gentle sludge removal so important in handling the light, "tricky" sludges encountered in the conventional and split activated sludge treatment processes.

Modern, performance-proved CHAIN Belt equipment and the broad experience of CHAIN Belt engineers provide the right combination for most effective results and maximum operating economies. For information on the complete line of Rex Sanitation Equipment, write CHAIN Belt Company, 4610 W. Greenfield Ave., Milwaukee 1, Wis.

CHAIN BELT

News of Suppliers

Four Top Sales Promotions At De Laval

De Laval Steam Turbine Co., Trenton, N. J., has announced four changes in the sales organization staff.

C. E. Cromwell has been appointed Manager of Commercial Sales, with responsibility for sales activities of commercial products including pumps, centrifugal compressors, turbines, and commercial gears. In addition to his new position, Mr. Cromwell will continue as Field Sales Manager. Mr. Cromwell, who has been with De Laval for 21 years, was Detroit District Manager from 1946 to 1957. He is a graduate of Rose Polytechnic Institute.

A. L. Foltz, Jr., Manager of the Detroit District Office since 1953, has been appointed Manager of the Chicago District Office. He is a graduate of Purdue University.

J. F. Donovan, a De Laval sales engineer for the past nine years, with tours of duty in the Detroit and Kansas City Offices, has been appointed Manager of the Detroit District Office. He is a graduate of the University of Pittsburgh.

The appointment of W. H. Mouquin, former Manager of the Chicago District Office for the past two and a half years, as Manager of the newly established New York District Office, temporarily located at 63 Vessey St., New York City.

Vulcan Opens Atlanta Headquarters

Vulcan Materials Co., Birmingham, Ala., has announced the opening of new concrete pipe divisional headquarters in Atlanta. All main office functions for this division will be located at 721 Angier Avenue, N.E., Atlanta, Ga. The mailing address is P. O. Box 6226—Station H., Atlanta.

Burton D. Smith, formerly sales manager of the division's Southern Cen-Vi-Ro Pipe Corp., at Mobile, Ala., will transfer to the new Atlanta offices to become Sales Manager-Pressure Pipe for the Concrete Pipe Division.

Jesse C. Maxwell is appointed Sales Manager, Non-Pressure Concrete Pipe for the Alabama-Georgia district with headquarters at Atlanta. Jeff B. Spotswood is appointed Sales Manager, Non-Pressure Concrete Pipe for the state of Florida with offices located at 311 O'Reilly Building, 237 West Forsyth St., Jacksonville, Fla.

Chain Belt Acquires Site For New Plant

Chain Belt Co., Milwaukee, Wis., has announced the acquisition of 92 acres of land in Madison, Indiana, to provide additional manufacturing capacity for the company's heavy machinery lines. The site was chosen because of its commercial transportation facilities and its central location in relation to certain market areas.

Construction of a new plant building is expected to start shortly. The new plant will permit consolidation of Chain Belt's present manufacturing operations now located in Niles and Newton Falls, Ohio, and Rock Island, Illinois.

Bailey Meter Promotes Kent

Bailey Meter Co., Cleveland, Ohio, has announced that L. R. Kent, has been appointed Resident Engineer in charge of the Richmond, Va. office. Mr. Kent is also Resident Engineer in charge of the Baltimore, Md. office—both offices being subdivisions of the company's Philadelphia district.

The Richmond territory covers southeastern Virginia. The Baltimore territory includes Maryland, Washington, D. C., and northern Virginia.

The Richmond office headquarters are at 17 S. Belmont Ave., Room 202, Richmond 21, Va. Headquarters for the Baltimore office are at 2026 Maryland Ave., Baltimore 18, Md.

Kent, who joined the company in 1924 as a cadet engineer, was graduated from Johns Hopkins University with a bachelor's degree in mechanical engineering. His professional activities include membership in the ASME and the ISA.

Robertshaw-Fulton Promotes Fitzpatrick

Fulton Sylphon Div., Robertshaw-Fulton Controls Company, has announced that R. E. Fitzpatrick has been appointed district sales manager in Cleveland, Ohio.

The Cleveland sales headquarters is located at 1991 Lee Road, Cleveland Heights, and serves upper Ohio, northern West Virginia and western Pennsylvania.

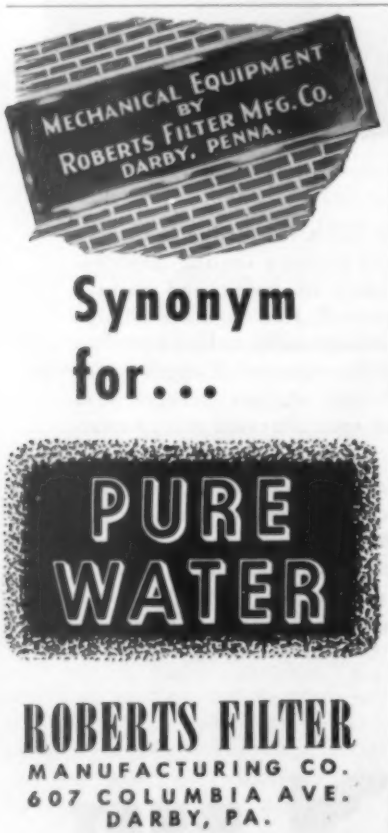
Mr. Fitzpatrick joined Fulton Sylphon in 1947. He attended Northeastern University, Boston. During World War II he served with the Corps of Engineers as first Lieutenant.

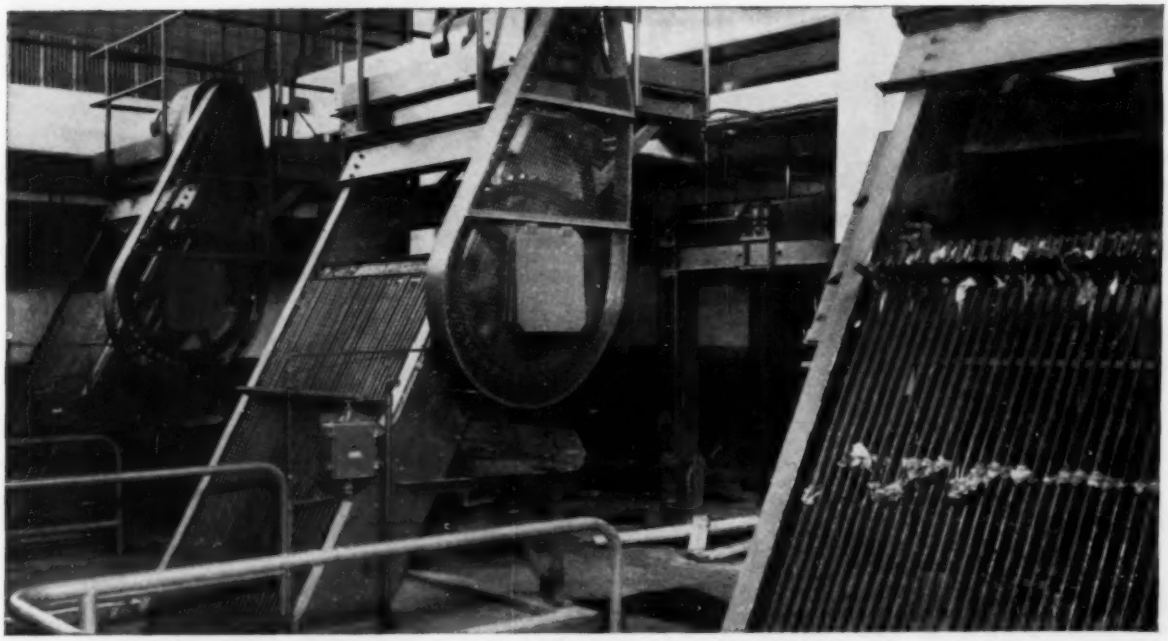
Cloroben Appoints Lockwood Sales Manager

Cloroben Chemical Corp., South Kearney, N. J., has announced the appointment of Charles N. Lockwood as sales manager.

Mr. Lockwood, who has an extensive sales background in both the chemical and petroleum field, will direct the distribution, sales and promotion of Cloroben.

In line with an expanded promotional and sales program distribution of Cloroben is being intensified in markets throughout the United States.

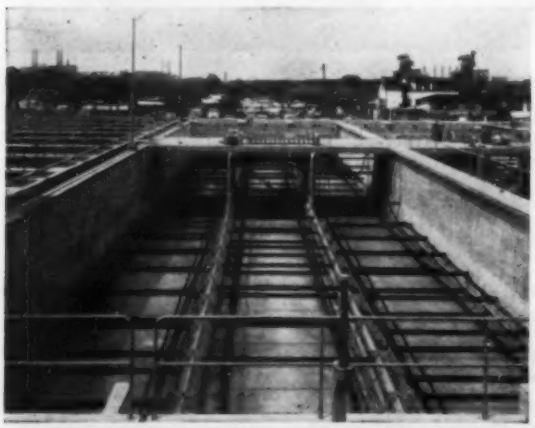




No jamming at bottom of screens *with mechanically back-cleaned Jeffrey Bar Screens. Rake lifts off accumulated screenings as the flow enters bars.*

Again... Bowery Bay Plant chooses Jeffrey sewage treatment equipment

Confidence in the efficiency and reliability of Jeffrey sewage treatment equipment resulted in its use in the original 40 mgd Bowery Bay Plant... when the World's Fair triggered New York City's long range attack on harbor pollution. Selection of Jeffrey Bar Screens and Collectors for the recent big extension of plant capacity (now 120 mgd) testifies to the performance record of the 18-year-old Jeffrey equipment.



Jeffrey Collectors *were specified for 6 primary settling tanks and 8 final tanks added at Bowery Bay. Under ordinary conditions, mechanical disturbance can be limited to less than 1 hour in 24, due to large carrying capacity.*

Jeffrey Bar Screens—Nine of these mechanically back-cleaned bar screens have been added to facilities at Bowery Bay. Rakes enter from discharge side and project through bars as they travel from bottom toward headshaft. Screenings are carried over the top and drop off as rakes leave the screen bars.

If screenings accumulate rake lifts them off as it enters the bars. This action virtually eliminates jamming at the bottom of the screen.

Primary and Final Settling Tanks—Rectangular tanks, equipped with Jeffrey Collectors, have proved to be the most efficient sedimentation device ever designed. Stable conditions of flow make possible maximum solids removal in tanks of minimum size. Simplicity and ruggedness of Jeffrey Collectors assure long life and trouble free operation.

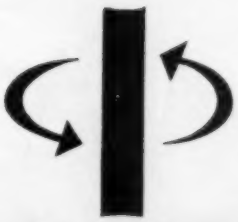
Large carrying capacity of Jeffrey Collectors permits intermittent operation... significant power savings, a thicker sludge and clearer effluent.

Once you review the facts on the design efficiency and quality of Jeffrey equipment for water, sewage and industrial waste treatment, you'll see why so many important projects specify Jeffrey. Send for Catalog 905, The Jeffrey Manufacturing Company, 996 North Fourth Street, Columbus 16, Ohio.

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT... TRANSMISSION MACHINERY... CONTRACT MANUFACTURING

OPERATING STABILITY IS INHERENT



in the FLO matcher

SEWAGE PUMP SPEED CONTROL SYSTEM

Discharge rate always exactly matches influent rate in a FLOmatcher controlled sewage pumping system, just as in a gravity flow system. This outstanding stability is possible because the inflow actually *controls* the discharge rate! A liquid rheostat provides a direct link, equalizing the two rates, and a wound-rotor (slip-ring) induction motor provides the power. A single pump usually handles all flow in a FLOmatcher system.

FLOmatcher insures maximum reliability, minimum maintenance, construction and operating economy, and exceptional flexibility. In addition, the expected life of a typical system is at least 25 years.

The Eugene, Oregon, Municipal Sewage Plant, where FLOmatcher has proved its stability and economy during years of steady service.

call or write the FLOmatcher sales representatives nearest you

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Portland 7, Oregon

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Waterworks Equipment Co.
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Salt Lake City 10, Utah
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Pocatello, Idaho
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Denver 18, Colorado

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Bert Gurney & Assoc.
510 Standard Oil Bldg.
Omaha 2, Nebraska

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Kansas City 8, Kansas

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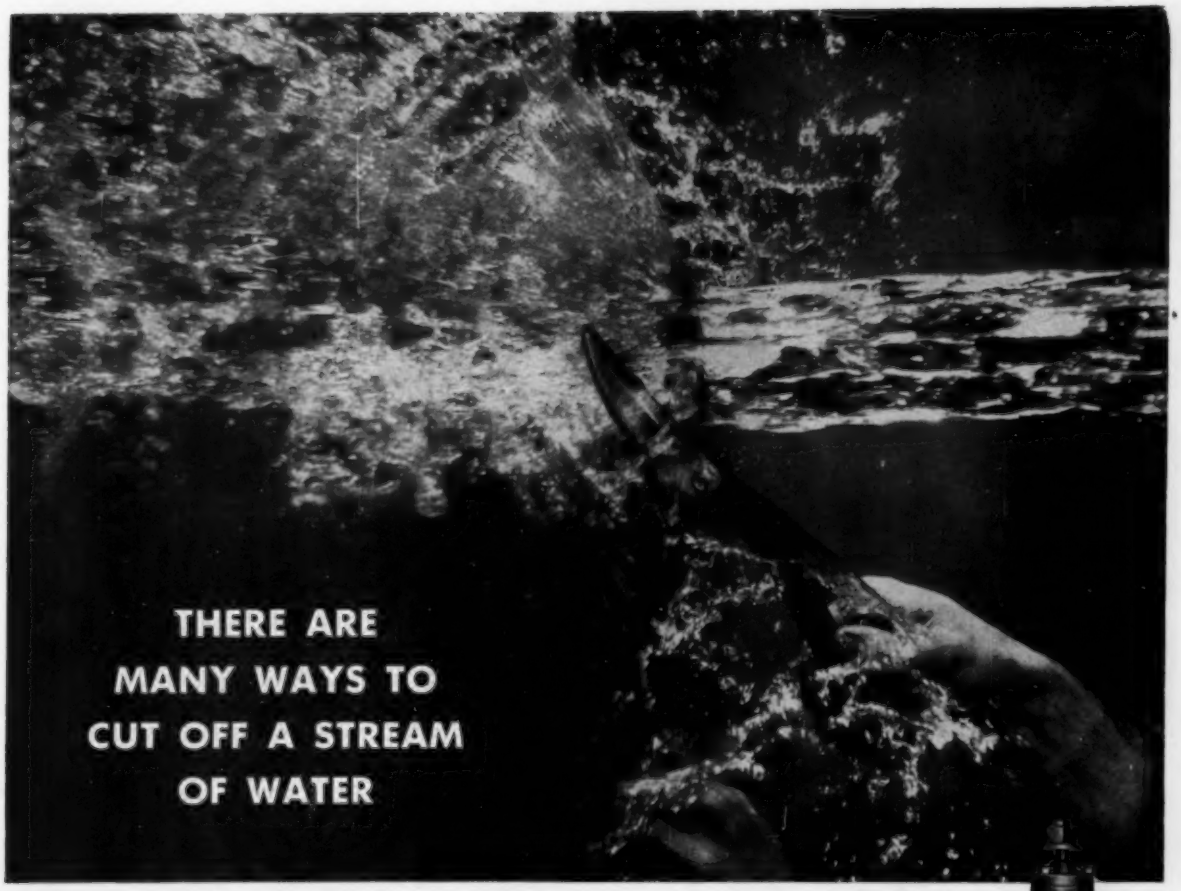

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Because Ludlow gate valves and Rensselaer gate valves assure *ease of operation, watertight closure and years of trouble-free performance.*

Combining simplicity and soundness of design with high quality workmanship, Ludlow and Rensselaer gate valves meet all the requirements of exacting engineers and water superintendents — and exceed A.W.W.A. specifications.

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Gate Valve Catalogs

BRANCHLINE CONNECTIONS TO MAIN LINES UNDER PRESSURE are made easier and more dependable by Ludlow and Rensselaer tapping sleeves and valves.

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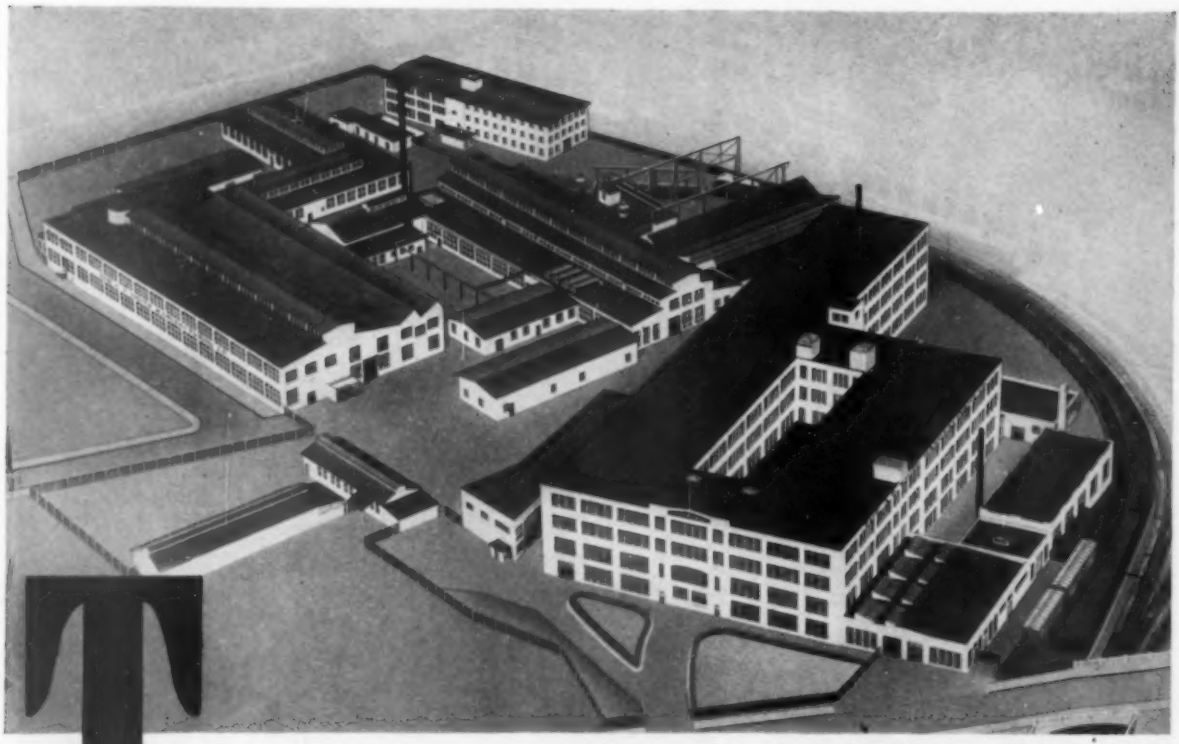
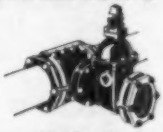
THE LUDLOW VALVE MANUFACTURING CO., INC., TROY, N. Y.—SINCE 1861



THE A. P. SMITH MANUFACTURING CO.

produces, FIRE HYDRANTS A. W. W. A. Specification and High Pressure — Compression Type — Dry and Wet Barrel Types. GATE VALVES sizes 2" thru 66", Manual, Hydraulic Cylinder, Electric Motor Operated for Low, Medium and High Pressure Service. INSERTING VALVES sizes 4" thru 48" for inserting under pressure.  TAPPING SLEEVE AND VALVES sizes 4" x 2" thru 60" x 48" for branch connections under pressure.

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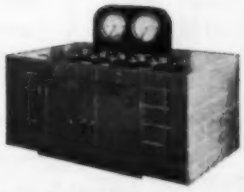
LEOPOLD RUBBER-SEATED BUTTERFLY VALVES

• Provide positive bubble-tight closure • Designed for quick, economical installation, easy operation, minimum upkeep.



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• More than 2000 now in service • Furnished in standard models or special designs for individual requirements with electric, hydraulic or pneumatic indicators. Also hydra-pneumatic control systems.

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• Available in three capacities for fast volume batch feeding of dry chemicals.

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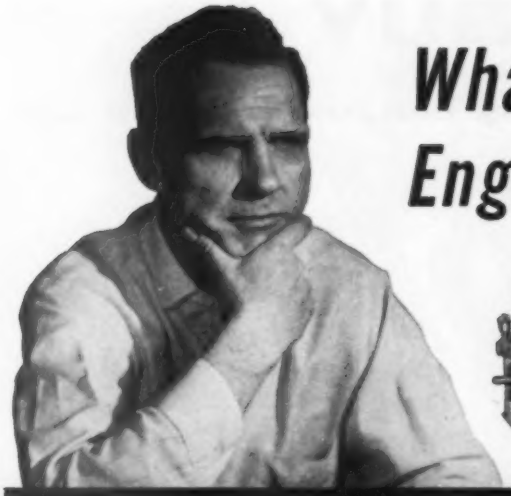
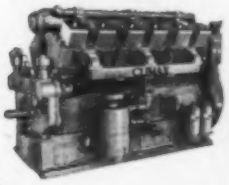
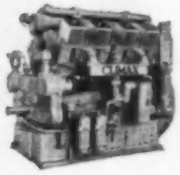


What Is An Economical Engine Investment?

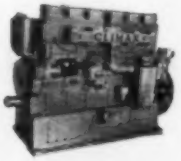


IS IT THE RIGHT ENGINE FOR THE JOB?

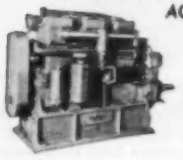


HOW EASY IS IT TO MAINTAIN?

A LITTLE THOUGHT ON THIS SUBJECT CAN SAVE A LOT OF MONEY!



WHAT ABOUT SERVICE?



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a complete line of gasoline, gas or butane engines for generator, pump and blower service . . . 6 cylinder to V-12 . . . 40 to 605 basic engine max. hp.

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Virginia: Richmond
West Virginia: Bridgeport, Charleston

SOUTHEAST
Florida: East Tampa, Jacksonville, Miami
Georgia: Atlanta
North Carolina: Charlotte, Fayetteville

MIDWEST
Illinois: Chicago, Grayville
Indiana: Indianapolis
Iowa: Waterloo
Kansas: Great Bend, Kansas City, Wichita
Kentucky: Lexington
Michigan: Detroit
Missouri: St. Louis
Nebraska: Omaha
Ohio: Cincinnati, Cleveland, Columbus
Wisconsin: Green Bay

SOUTH CENTRAL
Alabama: Birmingham
Louisiana: New Orleans
Mississippi: Natchez
Tennessee: Memphis, Nashville

SOUTHWEST
Arizona: Phoenix
Louisiana: New Iberia, Shreveport
New Mexico: Hobbs
Oklahoma: Duncan, Seminole, Oklahoma City
Texas: Abilene, Corpus Christi, Dallas, Houston, Kilgore, Odessa, Pampa, San Antonio, San Juan, Wichita Falls

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Helpful Bulletins

Water Filtration Plant Catalog

943

Dresser Mfg. Div., one of the Dresser Industries, Inc., Bradford, Pa., has just published a new Water Filtration Plant Catalog.

Pneumatic Sewage Ejector

944

The Mechanical Equipment Division of the Komline-Sanderson Engineering Corp., Peapack, New Jersey, has just published a new 14-page, two-color, illustrated catalog on the Komline-Sanderson Pneumatic Sewage Ejector systems.

Municipal and Industrial Sanitation

945

Dorr-Oliver, Inc., Stamford, Conn., has announced the availability of a new four-page, two-color bulletin entitled, "Seven Developments for Municipal and Industrial Sanitation."

Sewage Treatment Catalog

946

Dresser Mfg., one of the Dresser Industries, Inc., Bradford, Pa., has just released a new Sewage Treatment Plant Catalog.

Low-Cost Geared Coupling

947

Link-Belt Co., Chicago, Ill., has just released a folder describing their new, low cost MC geared coupling. The folder details pertinent application and selection data for the new MC couplings, which are designed especially for use as a motor coupling—for transmitting electric motor power to pumps, generators, speed reducers, etc.

OPPORTUNITY

Awaits Manufacturers Representative with good following among Sewage Treatment Plants and Consulting Engineers. Furnish experience, lines carried and territory actively covered.

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Mixing and aging tank for activated silica sol.

Activated Silica starts with "N"

"N" sodium silicate is the number one choice of water treating plants everywhere for uniform performance in producing activated silica sol. No matter what reactant you use or how you prepare the sol, "N" silicate is dependable. Write down the approximate composition—

N, 41° Baumé, 28.7% SiO_2, 8.9% Na_2O (weight 11.6 lb./gal.)

Let us quote on your requirements of sodium silicate. Prompt deliveries from nine plants. Complete literature on request.

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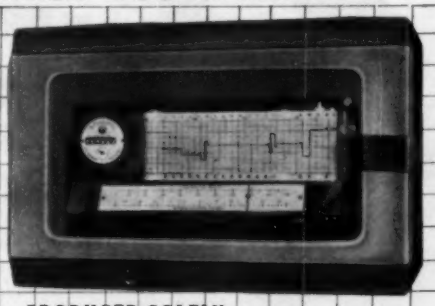
INSTALLATION, INSPECTION, READING— ALL SIMPLE WHEN YOU SPECIFY . . .

Sparling

RECORDING INSTRUMENTS



PRODUCED SOLELY FOR METERING

All Sparling recording instruments, both strip and circular chart, were designed, developed and produced solely for water metering. Over a period of many years, a wide variety has been in use, meeting practically every measurement need. They are designed with flexibility in mind—for centralized or decentralized installations, telemetering or remote hook-up—electrical or cable controls.

Investigate today the advantages of Sparling indicator-totalizers and recorders.

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GUNITE does it 2 times as fast at 1/2 the cost

"Gunite" is the modern process (sand and cement applied pneumatically) for repairing, constructing, lining:

- Reservoirs
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- Tanks
- Stadiums
- Bridges
- Sea Walls
- Swimming Pools, etc.

WRITE FOR MORE INFORMATION, INCLUDING 48 PAGE "GUNITE" BOOKLET.

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AIR VALVES

...control air safely and efficiently

These basic advantages are yours when you use Crispin Air Valves . . . simplified construction, easy accessibility, maximum durability, minimum maintenance and efficient operation. You're *safe* with Crispin Air Valves on the job!

Crispin COMBINATION AIR VALVES . . . reduce installation and operating costs where a combination of an Air and Vacuum Valve and a Pressure Air Valve are required.

Crispin NEGATIVE PRESSURE AIR VALVES . . . release air semi-automatically from pipeline siphons to end the danger of throttled pipelines.

Crispin MIDGET AIR VALVES . . . ideal for venting hot water systems and are particularly useful in panel type units—synthetic plunger makes a perfect seal at all times.

AIR CONTROL VALVES • FOR OVER 45 YEARS

Write, wire or phone for complete information on dependable Crispin Air Valves that keep your pipelines open for safe, economical operation

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Dept. B

Helpful Bulletins

New Concepts in Air Diffusion 948

Walker Process Equipment, Inc., Aurora, Ill., has just released a new 8-page 2-color bulletin discussing the theory and application of air diffusion, in sewage and waste treatment.

Degritting Clarifier 949

Dorr Oliver, Inc., Stamford, Conn., has announced the availability of a new four-page, two-color bulletin entitled, "The Degritting Clarifier and Clarigester." Also included are installation photographs and sectional elevation drawings of typical grit handling facilities of this new design.

Primary Flow Metering Elements 950

Builders-Providence, Inc., a division of B-I-F Industries, Inc., Providence, R. I., has prepared a small, convenient 16-page folder to assist in selecting the proper differential producer for every flow metering situation. The heart of the folder is a table

Ductile Iron Pipe Fittings 951

Kuhns Brothers Co., Dayton, Ohio, has released a new 8-page illustrated catalog giving complete data on ductile iron pipe fittings.

Valve Actuating Conversion Unit 952

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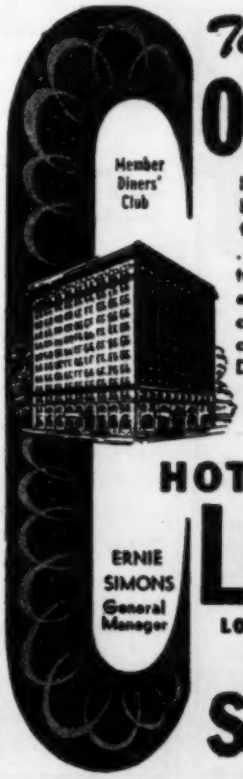

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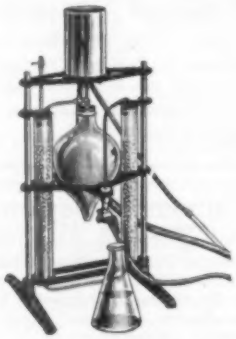

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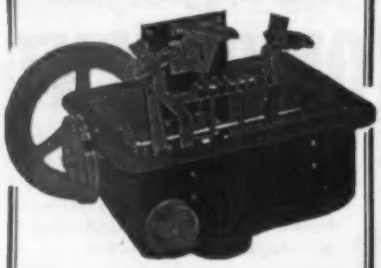

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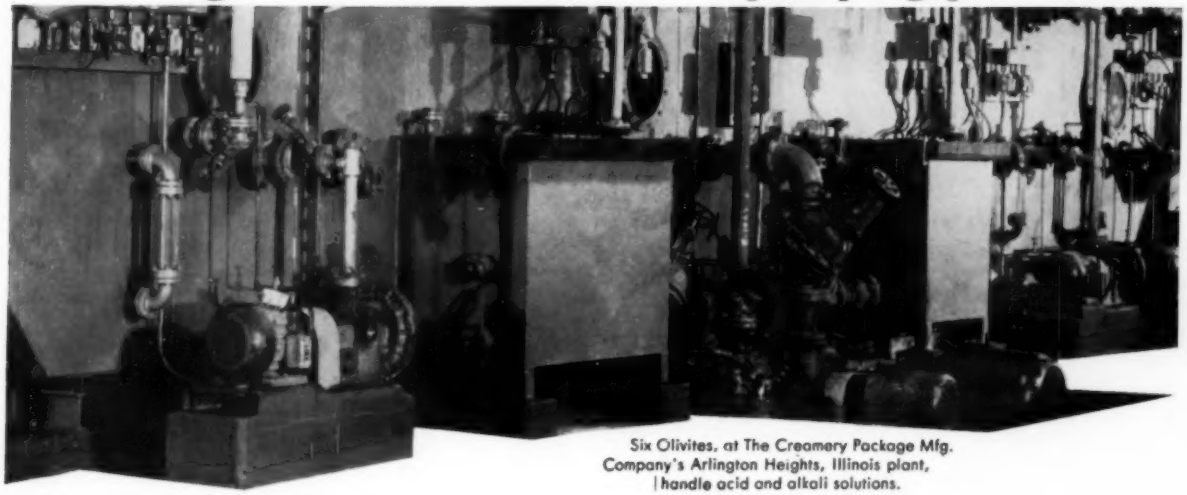

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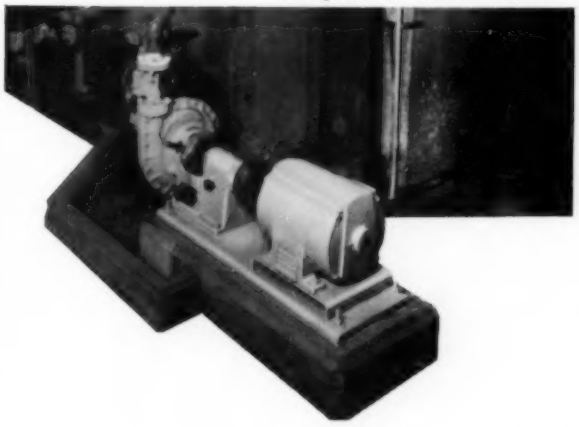

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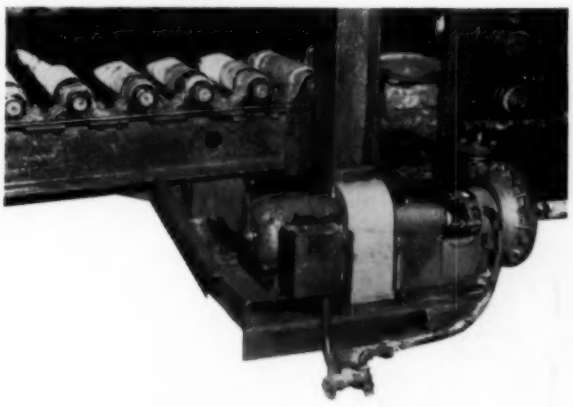

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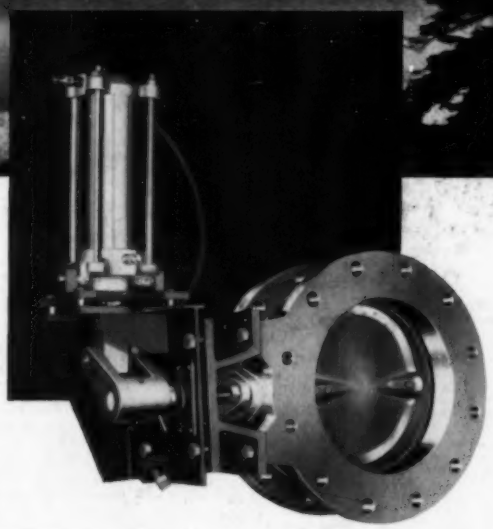

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